THE AMERICAN JOURNAL OF ROENTGENOLOGY AND RADIUM THERAPY

VOL. XXIII JANUARY, 1930 NO. 1

PRIMARY HEMANGIOMA OF BONE

WITH SPECIAL REFERENCE TO ROENTGENOLOGIC DIAGNOSIS*†

By PAUL C. BUCY, M.D., *and* CHARLES S. CAPP, M.D.

CHICAGO, ILLINOIS

IN 1917 Hitzrot[23] published the first roentgenogram of a hemangioma of bone (Fig. 1). At that time he stated that "comparison of a number of such pictures and a careful study of a group of these cases may show diagnostic radiographic evidence which is not now possible." We hope, with the cases at hand, to fulfill this prophecy, at least in some degree.

It is not at all surprising that hemangioma of bone has remained only a pathological entity. Until recently it could be truthfully said that no one had seen more than one or two cases. The recent work of Makrycostas[27] and Töpfer[46], which we will discuss later, has shown that hemangioma of bone, at least of the vertebrae, is very common at the necropsy table, but seldom produces symptoms.

We wish to present the following 8 cases of hemangioma of bone,* 7 with roentgenograms and one without, for the purpose of establishing this condition as a roentgenological entity, for we believe that in the majority of cases a diagnosis can be made from the roentgenogram. Although in a

FIG. 1. Roentgenogram of hemangioma of the humerus. Note the loculations and the location near the epiphysis. (After Hitzrot.)

* Two cases from the Albert Merritt Billings Hospital, University of Chicago, and 5 cases from the Registry of Bone Sarcoma, American College of Surgeons; also one case from the private records of Dr. D. B. Phemister, University of Chicago.

* From the Department of Surgery and the Division of Roentgenology of the University of Chicago. Read at the Thirtieth Annual Meeting, American Roentgen Ray Society, New York City, Sept. 17–20, 1929.

† Some of the material for this study was very kindly furnished by the Registry of Bone Sarcoma of the American College of Surgeons.

very few instances the clinical signs and symptoms are of such a nature as to point to a possible diagnosis of hemangioma of bone, in the majority of cases they offer nothing of diagnostic significance.

I. HEMANGIOMA OF THE VERTEBRAE

The following is a case of hemangioma of the vertebrae previously reported by Bailey and Bucy.[1] At the time this case was studied in the clinic we were not aware of the work of Perman[34] and therefore an error in diagnosis was made. However, the roentgenogram of hemangioma of the vertebrae is sufficiently characteristic to prevent similar mistakes in the future. These cases form a clinical and roentgenological entity, and seem to differ somewhat from cases of hemangioma of other bones of the body.

CASE 1. *Registry of Bone Sarcoma No. 940, A.M.B.H. No. 7881. Hemangioma of the third, fourth, fifth, and sixth dorsal vertebrae with compression of the spinal cord. Laminectomy. Roentgen therapy. Complete recovery.*

Admission. November 12, 1928, Mrs. S. M., a Jewish housewife, aged sixty-two, was admitted to the Albert Merritt Billings Hospital, referred by Drs. Peter Bassoe and D. B. Rotman of Chicago, Ill.

Clinical History. As this has been given in detail elsewhere[1] it will only be summarized briefly here. Patient stated that until about ten months before admission she had been perfectly well, when one day she suddenly fell while walking, and when helped to her feet she was unable to stand. This condition improved somewhat shortly afterward, but about two months later a second attack occurred. Following this she had difficulty in walking which persisted and gradually increased. Other signs of compression of the spinal cord gradually developed and were present at the time of her admission to this hospital.

Neurological examination revealed a band of hypesthesia to tactile stimuli about 7 cm. wide, the lower margin of which was about 2 cm. above the umbilicus. Above this was a narrow zone of hyperthermoesthesia and hyperalgesia. There was a similar reaction to stimuli on the anterior surface of the upper two-thirds of the left thigh. There was a marked loss of sense of position in both feet and legs. The lower extremities showed marked loss of strength in all muscle groups, especially the flexors. The abdominal reflexes were all absent. The patellar and Achilles tendon reflexes were hyperactive and equal. Babinski's sign was positive on both sides. The patient was barely able to maintain herself in the upright position, she swayed markedly, and was unable to walk alone. When supported the gait was both spastic and ataxic.

Lumbar puncture was done and the Queckenstedt test revealed that the cerebrospinal

FIG. 2. Case 1. Cavernous hemangioma of third, fourth, fifth and sixth dorsal vertebrae. Note the coarse vertical trabeculae in the vertebral bodies, especially evident in the fifth and sixth.

fluid did not rise on jugular compression, definite evidence of a cerebrospinal fluid block.

Roentgen-Ray Examination. November 14, 1928 (Figs. 2 and 3).

"Films show distinct mottled appearance of the bodies of the third to sixth dorsal vertebrae

Fig. 3. Case 1. The coarse trabeculae are very evident in the bodies of the fifth and sixth dorsal vertebrae as compared with the normal seventh. Marked thickening and mottling of the pedicles are also seen.

inclusive, the fourth being but slightly involved. The posterior vertical portions of the bodies of the vertebrae are quite indistinct except for the fourth. The trabeculations of the bone are about three times their normal size, with loss of the normal homogeneity. Vertical parallel striations are present in the bodies of the third, fifth, and sixth dorsal vertebrae. The abnormal trabeculations extend into the pedicles which appear thicker in diameter than normal, and apparently encroach on the spinal canal. No crushing is seen of the vertebral bodies, no changes in the intervertebral discs, nor diminution of the intervertebral spaces. If the appearance were generalized one might consider patchy decalcification of disuse, but with the localization to certain bodies, a non-bone producing neoplasm must be excluded."

The chest films showed no evidence of pulmonary metastases.

Using the roentgenoscopic method, described by Sicard and Forestier[42], of visualizing a block in the subarachnoid space about the cord, it was observed that the lipiodol which had been injected into the lumbar sac passed rapidly through the subarachnoid space, when the patient was placed with her head down, and stopped abruptly at the lower edge of the sixth dorsal vertebra. This is clearly shown in Figure 4 which was taken on the roentgenoscope.

Fig. 4. Case 1. Roentgenogram taken with the patient's body inverted. Abrupt blocking of the lipiodol at the lower margin of the sixth dorsal vertebra.

Operation. On November 19, 1928, under ethylene and ether anesthesia a laminectomy of the fifth, sixth, and seventh dorsal vertebrae was performed by Dr. Percival Bailey. The bone was very soft and bled furiously. The spinal canal was found to be very small as a result of the encroachment by the hypertrophied vertebral bodies and arches. The spinal cord was greatly reduced in size. The fourth dorsal vertebra caused no reduction in the size of the canal, and neither apparently did the third for fluid came freely from above.

The patient's immediate postoperative condition was very critical, but the use of stimulants, fluids and external heat improved her condition in a few hours.

Roentgen therapy was given as noted in table below.

Field covered 15 cm. diameter, centering at fourth dorsal vertebra posterior; 550 R-units (measured in air) = erythema dose. Effective wave length 0.165 Å Duane[12] (using 1 mm. Cu filter and 12.5 cm. diameter sphere gap).

She improved rapidly, and was discharged eighteen days after operation. She was having no pain or discomfort and was able to walk

ROENTGEN THERAPY

Date	Kilovoltage	Filtration	Focal Skin Distance	Dosage in R-Units
Nov. 30, 1928	200	0.5 mm. Cu+1 mm. Al	50 cm.	183.0
Dec. 3, 1928	200	0.5 mm. Cu+1 mm. Al	50 cm.	183.0
Dec. 5, 1928	200	0.5 mm. Cu+1 mm. Al	50 cm.	183.0
Dec. 7, 1928	200	0.5 mm. Cu+1 mm. Al	50 cm.	110.0
Dec. 28, 1928	200	0.5 mm. Cu+1 mm. Al	50 cm.	137.5
Jan. 28, 1929	200	0.5 mm. Cu+1 mm. Al	50 cm.	137.5
Feb. 25, 1929	200	0.5 mm. Cu+1 mm. Al	50 cm.	110.0
July 31, 1929	200	0.5 mm. Cu+1 mm. Al	50 cm.	137.5

FIG. 5. Case 1. Large cavernous vascular channels fill the intertrabecular spaces. There is a fractured bony spicule in the lower right-hand corner. Mallory's aniline blue (X 60).

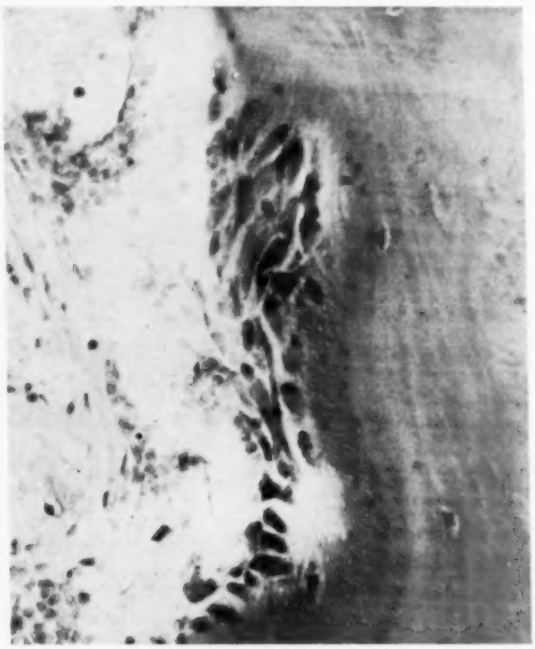


FIG. 6. Case 1. Numerous osteoblasts along a spicule of bone in the area involved by the hemangioma. Hematoxylin and eosin (X 275).

fairly well with support. When last seen on July 31, 1929, she was walking alone without ataxia or spasticity. She had no complaints whatever. Her reflexes and sensations were normal and she reported normal activity of both bladder and bowel.

Microscopical Description. The tissue available for study is, of course, only from the spines and laminae removed at operation. It was fixed in formalin, decalcified and stained with hematoxylin and eosin. Some sections (probably from the uninvolved seventh dorsal vertebra) show normal bone. In the involved areas we see the intertrabecular areas filled with dilated cavernous spaces instead of normal myelogenous tissue (Fig. 5). The cavernous spaces contain blood cells. Occasionally fat cells can be seen about these dilated vascular spaces. The walls of the spaces are lined by a single layer of endothelial cells resting on a thin network of loose connective tissue. Among the spindle cells of the connective tissue can be seen a few large round cells with small round nuclei and markedly granular eosinophilic and basophilic cytoplasm. In some areas these cells are collected into small nests. Their exact nature is not certain, though they are probably remnants of the myelogenous tissue. Two changes are evident in the bone itself. In many areas the edges of the trabec-

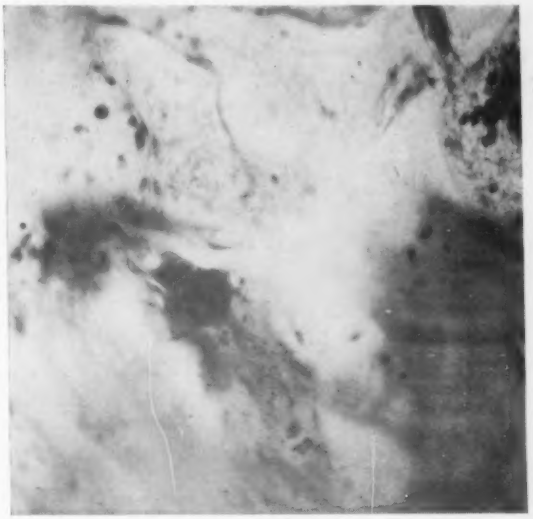


Fig. 7. Case 1. Multinucleated giant cell (osteoclast) destroying the bone in the region of the hemangioma. Hematoxylin and eosin (X 275).

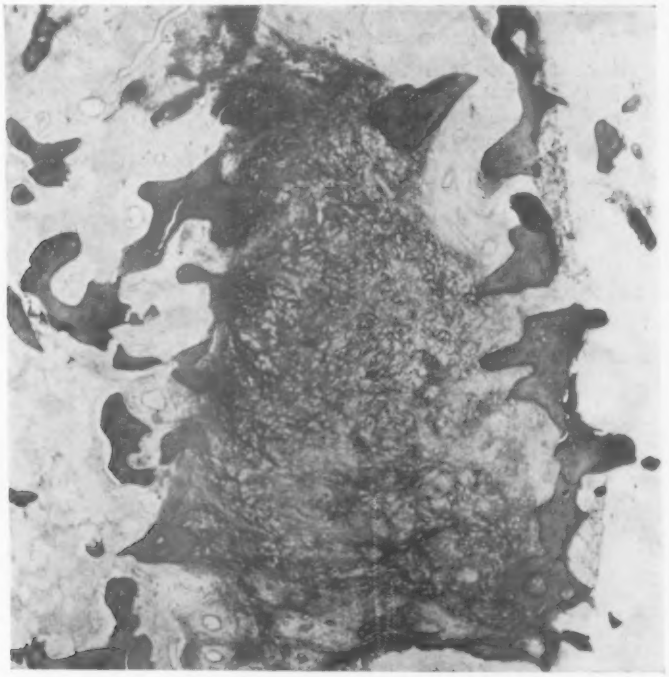


Fig. 8. Case 1. Strand of fibro-cartilage with numerous small spicules of newly formed bone projecting from its sides. Hematoxylin and eosin (X 60).

ulae are lined with osteoblasts (Fig. 6), and new bone formation is seen. In other areas erosion of the bony spicules by multinucleated giant cell osteoclasts is present (Fig. 7). Much of the bone shows degenerative changes. It has become homogeneous and stains deeply with eosin. The cells are shrunken or absent and the lacunae are dilated. In some sections can be seen long bands of fibrocartilage with numerous spicules of newly formed bone projecting from the sides (Fig. 8).

Discussion. This case with the published roentgenograms of Perman[34] (Fig. 9) and Gold[19] (Fig. 10) should firmly establish the roentgenologic appearance presented by this lesion. There is irregular absorption of bony trabeculae, and thickening of the remaining vertical trabeculae with resulting parallel vertical striations in the bodies of the vertebrae, together with loss of the normal homogeneous bony structure in the roentgenogram. The abnormal trabeculations may extend into the vertebral arches and laminae. More than one body may be involved. The anteroposterior view, due to superimposition of the sternum, heart and mediastinal structures, does not show the bone changes as well as the lateral view, which is truly diagnostic. Only one case reported by Ewing,[14] showed compression of the body of the vertebra. Evidently, as Töpfer[46] points out, the remaining trabeculae are sufficiently rigid to support the body weight. There is no apparent diminution in the intervertebral spaces.

The microscopic slides from our case (Fig. 5) and that of Perman show great similarity. In both one sees large dilated thin-walled vascular spaces and a meager amount of supporting connective tissue network. Unfortunately, Gold[19] furnished no satisfactory photomicrographs from his case.

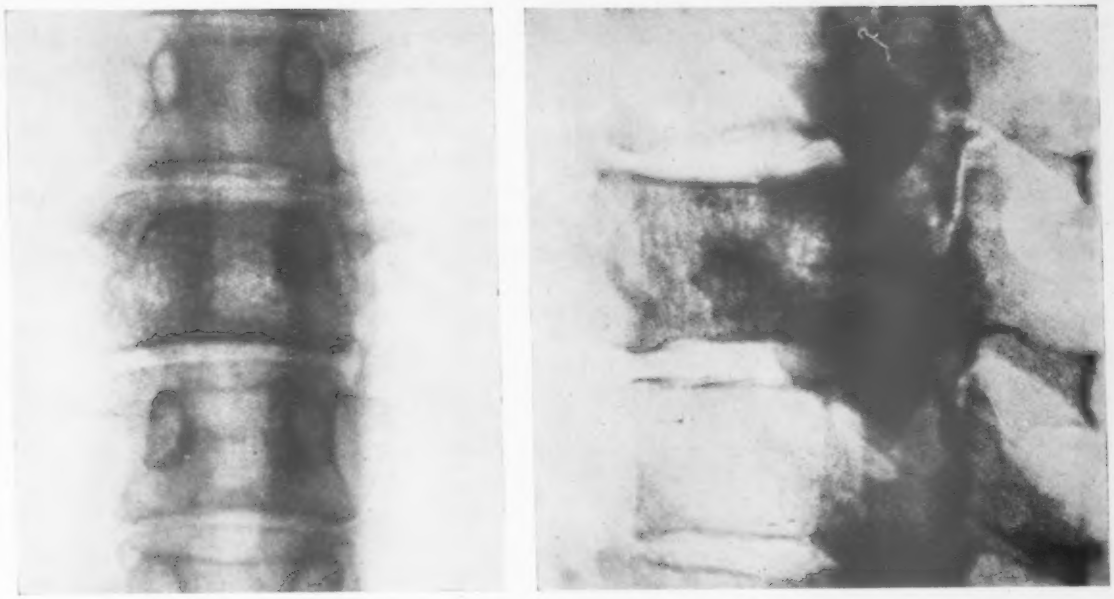
The case of Perman was very similar clinically to the one presented here. Examination revealed a compression myelitis, and a laminectomy was performed which gave relief. However, as in our case, the patient nearly died of shock and hemorrhage. Postoperative roentgen therapy was given and the patient is alive, well and working more than three years after operation. The roentgen examination at the present time shows no advance of the lesion.

Results are not always so satisfactory, however. The patients of Elsberg,[18] Gold,[19] and of Guillain, Decourt and Bertrand[20] died of hemorrhage and postoperative shock. Thus in the 5 cases which have been operated on, we find a 60 per cent operative mortality.

It has always been said that hemangioma of the vertebrae is rare. Clinically this is true. We have been able to collect from the literature only 11 cases which produced symptoms. These we have arranged in tabular form (Table 1). It will be noted that there seems to be no preponderance of cases in any one age group, but that women are affected more often than men, 9 to 2. We also see that in every case except one, the symptoms were those of compression myelitis and therefore indistinguishable from those of extramedullary tumor of the spinal cord, except by roentgen ray. In the other case, that of Makrycostas,[27] the symptoms were not reported. The author only stated that an ante-mortem diagnosis of caries of the fifth lumber vertebra had been made.

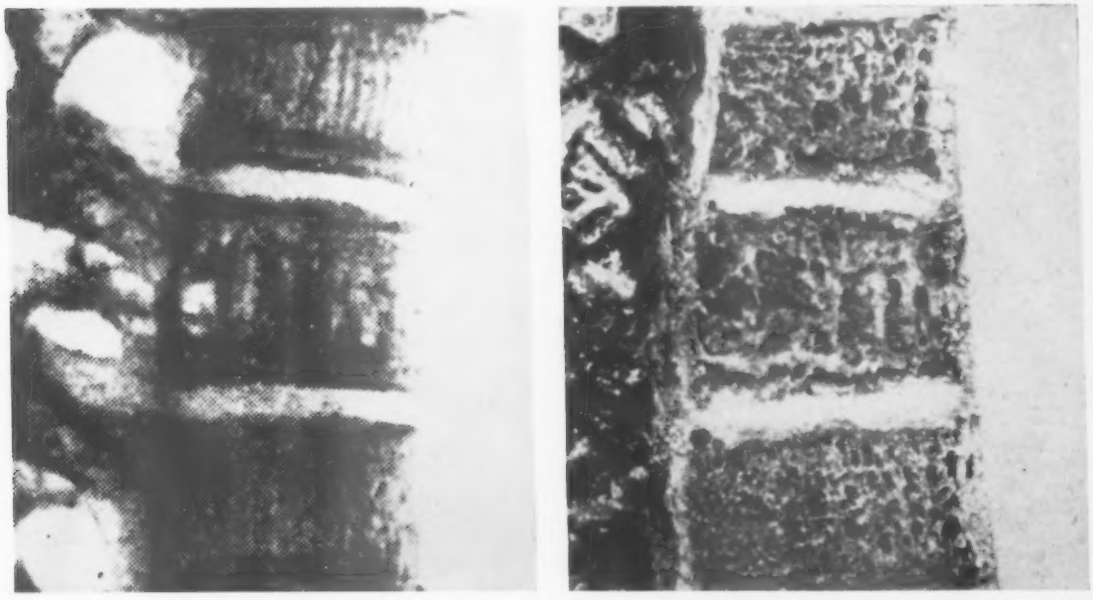
Pathologically hemangioma of the vertebrae is not a rarity. Makrycostas found 11 cases at autopsy which had not produced symptoms because they were limited to the bodies of the vertebrae. Saltykow,[39] Pentmann[33] and Fibiger[15] reported one case each. These are also arranged in tabular form (Table II). It will be noted that the lesion in these cases is more frequent in females than in males, 9 to 4, and also that the middle dorsal vertebrae are most commonly involved; occasionally other dorsal or lumbar vertebrae, but the cervical vertebrae have always escaped.

Stimulated by Makrycostas's finding of 11 cases of hemangioma of the vertebrae without symptoms, Töpfer[46] sectioned sagittally the vertebral columns of 2154 bodies at necropsy. In 257 of these cases, 11.93 per cent, he found angiomas of the verte-



a b

Fig. 9. Roentgenogram of hemangioma of eighth dorsal vertebra. Note the increase in density of the vertebral body due to the numerous vertical bony trabeculae best seen in the lateral view. a. Anteroposterior view. b. Lateral view. (After Perman.)



a b

Fig. 10. a. Roentgenological appearance of hemangioma of the sixth dorsal vertebra, after removal of the specimen from the body at necropsy. b. Appearance of the vertebral body involved by hemangioma. Note the thickness of the remaining bony trabeculae and the absorption of bone between them as compared with normal bodies above and below. (After Gold.)

brae. In 34 cases there were multiple angiomas of the vertebrae. Most of them involved the bodies of the vertebrae but in 4 cases angiomas were found in the spinous processes and in 3 cases in the arch. In some cases he found angiomas in other bones of the body, 9 in the sternum, 3 in the skull, and 3 in the femur. Four cases had angioma of the liver. As we have previously stated, these tumors produced no known symptoms. This is readily understandable when one considers that in none of these instances did the angiomas extend into the spinal canal, or even perforate the cortex of the bone except in one case where the superior surface of the body was eroded and the intervertebral cartilaginous disc had prolapsed into the defect. These

TABLE I

HEMANGIOMA OF VERTEBRAE

With Symptoms

Author	Sex	Age	Vertebra	Symptoms	Treatment	Result	Remarks
Gerhardt[17]	M	18	5th, 6th D	Compression myelitis		died, 5 yrs. after onset, of erysipelas	also angioma in spinal canal
Muthmann[30]	F	61	6th D	Compression myelitis with kyphosis		dead	extended subpleurally; also angioma of dura
Trommer[50]	F	17	5th, 6th D	Compression myelitis		died 14 mos. after onset	extended into spinal canal
Deetz[11]	F	42	?	Compression myelitis		dead	
Ribbert[38]	F	young	a dorsal	Compression myelitis		dead	multiple angiomas
Virchow[52]	F	old	?	Compression myelitis		dead	angioma in liver
Gold[19]			6th D	Compression myelitis	laminectomy	died of hemorrhage	angioma of dura
Perman[34]	F	24	8th D	Compression myelitis	laminectomy and x-ray	complete recovery	almost died of shock and hemorrhage
Globus and Doshay[18] Ewing[14]	F	13	8th D	Compression myelitis	laminectomy	dead	collapse of vertebral body
Guillain, Decourt and Bertrand[20]	M	18	7th, 8th, 9th D	Compression myelitis	laminectomy	died of hemorrhage	
Makrycostas[27]	F	75	Three L	"Pott's Disease"	?	dead	died of pneumonia
Case I	F	61	3d, 4th, 5th, 6th D	Compression myelitis	laminectomy	recovery	

tumors varied greatly in size from that of a pea to complete involvement of the vertebral body. In 41 cases the angiomas were associated with lipomatous formations. The microscopic picture corresponded with that of the case presented here. Töpfer's table (Table III) showing the age and sex of these cases is given here.

To Summarize: Hemangioma of the vertebrae is a relatively common finding, yet it rarely causes symptoms. Symptoms when present are those of compression of the spinal cord and are indistinguishable from those of tumor of the spinal cord. The roentgen findings are characteristic and afford a ready means of diagnosis, although Globus and Doshay[18] have recently stated that their material did not seem conclusive in this regard.

II. HEMANGIOMA OF OTHER BONES

Hemangioma of bones other than the vertebrae can be divided into two types on a roentgenological basis, and we shall make this difference clear in due time. However, clinically such a division cannot be made and we shall present the follow ng 7 cases together.

Type 1. Case 11 is of particular interest because roentgenograms were taken throughout the course of the illness and we are

TABLE II

HEMANGIOMA OF VERTEBRAE

Without Symptoms

Author	Sex	Age	Vertebrae	Remarks
Saltykow[39]	F	28	10th D to 3d L	Necropsy finding
Pentmann[33]	F	56	1st L	Angioma of spleen and liver
Fibiger[15]	—	—	5th L	—
Makrycostas[27]	F	29	a lumbar	Died of tuberculosis
Makrycostas[27]	F	71	3d and 4th L	Died of tuberculosis
Makrycostas[27]	F	67	Two vertebrae	Died of acute bronchitis
Makrycostas[27]	M	66	11th D	Died of pneumonia
Makrycostas[27]	F	66	6th D	Died of leucemia
Makrycostas[27]	F	90	6th D	Died of tuberculosis
Makrycostas[27]	M	81	4th D, 1st and 4th L	Died of pneumonia
Makrycostas[27]	M	78	6th, 8th, 9th, 11th D; 1st, 2d, 3d, 4th, 5th L	Died of pneumonia
Makrycostas[27]	F	70	4th, 6th, 12th D; 2d, 4th L	Died of pneumonia
Makrycostas[27]	F	60	6th D	Died of carcinoma of breast
Makrycostas[27]	M	71	4th, 7th, 9th, 12th D; 2d, 3d L	Died of pneumonia

Töpfer[46] 257 cases out of 2154 bodies examined at autopsy (see Table III).

TABLE III

HEMANGIOMA OF THE VERTEBRAE

Without Symptoms

Age	0–20	21–30	31–40	41–50	51–60	61–70	Over 70	Total	Per Cent
Male	3	4	7	16	15	32	41	118	45.9
Female	1	1	8	7	20	40	62	139	54.1
Total	4	5	15	23	35	72	103	257	
Per Cent	1.56	1.94	5.83	8.95	13.61	28.01	40.07		

Statistical tabulation of the 257 cases of hemangioma of the vertebrae found by Töpfer in the routine examination of 2154 bodies at necropsy. Modified after Töpfer.

able to study the progress of the lesion from a roentgenologic standpoint.

Case II. *Registry of Bone Sarcoma No. 941, A.M.B.H. No. 4068. Cavernous hemangioma of right scapula. Ankylosis right shoulder joint. Biopsy. Roentgen therapy. Improvement.*

Admission. Mrs. M. L., white female, aged forty-nine, admitted to the Albert Merritt Billings Hospital on May 2, 1928.

Clinical History. Patient admitted to hospital because of symptoms of hyperthyroidism. Subtotal thyroidectomy performed at this clinic on May 19, 1928. Excellent recovery as far as thyroid condition is concerned.

However, during this admission the following history relative to the right shoulder was elicited. In March, 1925, while doing housework, the patient "wrenched" her right shoulder and subsequently she suffered from dull aching pains in this region. The following week the same shoulder was again injured, and since then there had been a dull continuous ache. A physician called at that time made a diagnosis of "neuritis" and gave the patient medicine which was taken for several months without any evidence of improvement. The patient then went to a chiropractor. The shoulder at this time was stiff and the arm could not be raised above the head. The chiropractor manipulated the shoulder, causing much pain. She then consulted another physician who diagnosed a "dislocated shoulder." The patient was taken to a hospital and the dislocation (?) reduced under anesthesia. This did not relieve the symptoms. The patient was then treated with diathermy for several months without benefit. By this time the only possible motion was in an anteroposterior plane. The pain continued.

Following the thyroidectomy in May, 1928, the patient stated that the pain in the shoulder was less but the joint remained stiff and abduction was impossible. On October 18, 1928, she returned to the clinic because of continued trouble with her shoulder. She now noted that when the arm was moved forward or backward the scapula moved with it.

Examination. General physical examination, including the chest, had always been negative

Fig. 11. Case II. Roentgenogram taken on March 22, 1926.

except for the findings of hyperthyroidism and those relative to the shoulder.

On May 2, 1928, it was noted that the shoulder joint was almost completely fixed and that there was considerable wasting of the musculature about the right shoulder. On May 14, a mass over the posterior surface of the right scapula was noted. It occupied both the supra- and infraspinous fossae. The spine of the scapula could not be differentiated from the mass. Abduction of the arm was impossible. On October 27, 1928, complete ankylosis of the shoulder joint was found. The swelling was hard and somewhat tender to palpation and careful examination failed to elicit either a pulsation or bruit.

All laboratory examinations failed to reveal anything of pathological significance.

*Roentgen-Ray Examination.** "May 2, 1928

* Figure 11, dated March 22, 1926 and Figure 12, dated March 9, 1927, which were taken in other hospitals, were not available at this time. These early films show a large defect in the neck of the scapula near the glenoid cavity and a few radiating bony trabeculae of very large size.

ROENTGEN THERAPY

Date	Kilovoltage	Filtration	Focal Skin distance	Dosage in R-Units
Oct. 26, 1928	200	0.5 mm. Cu+1 mm. Al	50 cm.	92.0
Oct. 31, 1928	200	0.5 mm. Cu+1 mm. Al	50 cm.	137.5
Nov. 5, 1928	200	0.5 mm. Cu+1 mm. Al	50 cm.	137.5
Nov. 9, 1928	200	0.5 mm. Cu+1 mm. Al	50 cm.	183.0
Nov. 14, 1928	200	0.5 mm. Cu+1 mm. Al	50 cm.	183.0
Jan. 7, 1929	200	0.5 mm. Cu+1 mm. Al	50 cm.	183.0
Feb. 11, 1929	150	0.25 mm. Cu+1 mm. Al	50 cm.	117.0
Mar. 25, 1929	150	0.25 mm. Cu+1 mm. Al	50 cm.	157.0
May 6, 1929	150	0.25 mm. Cu+1 mm. Al	50 cm.	137.5

Fig. 12. Case II. Roentgenogram taken March 9, 1927, showing progress of the lesion and increase in bony trabeculae in the tumor.

(Fig. 13). 'Sun-burst' appearance of trabeculations of large size arising from a common center, which radiate mostly at right angles to the plane of the bone; the periosteum is elevated but apparently not broken through. Diffuse haziness of the outer limits of the tumor. The bony mass involves the coracoid process, the root of the scapular spine, the glenoid cavity, and extends as far as the vertebral border and downwards as far as the middle of the blade. Appears to be some form of benign osteoma."

Roentgen examination made October 16, 1928, showed an apparent increase in the size of the lesion, with also slightly increased bone production.

Operation. Although it was felt that the lesion was benign it was decided to do a biopsy to determine its true pathological nature and this was carried out on October 18, 1928. The tumor bled profusely; the wound was packed to control the hemorrhage and sutured.

Roentgen therapy was given according to table on page 11. Field, 15 cm. diameter on the skin, irradiating posterior right scapula. Erythema dose equals 550 R-units (measured in air). Effective wave length 0.165 Å Duane[12] (for 200 kv., 0.5 mm. Cu+1 mm. Al) and 0.187 Å (for 150 kv., 0.25 mm. Cu+1 mm. Al).

During the course of the roentgen therapy the pain completely disappeared. The patient felt there was some increase in motion of the extremity, and the tumor mass was noted to have decreased in size.

The roentgenogram (Fig. 14, taken Feb. 11, 1929) following the roentgen therapy shows a marked increase in the number and thickness of the bony trabeculae and a much more definite bony outline.

When last seen on May 6, 1929, the soft tissue mass had entirely disappeared and there was no pain nor tenderness.

Microscopical Examination: Formalin fixation, hematoxylin-eosin stain.

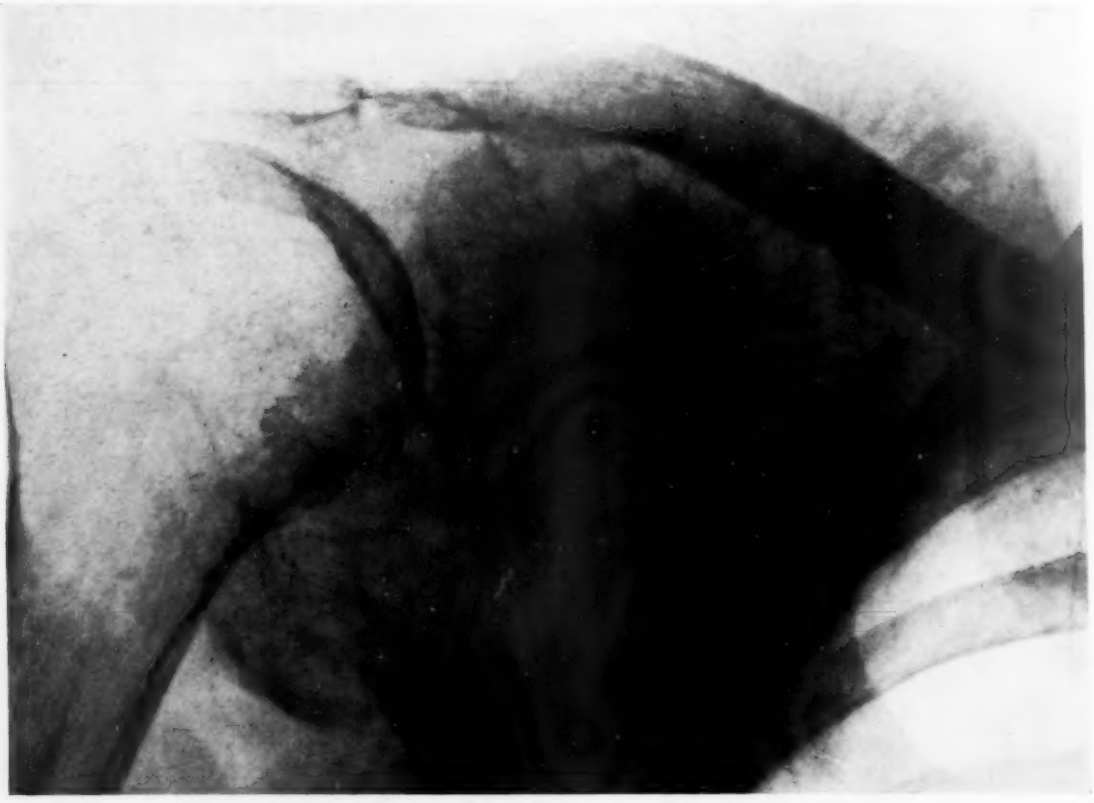


FIG. 13. Case II. Roentgenogram taken on May 2, 1928, showing marked growth of the tumor. Note the numerous trabeculae radiating from the center of the tumor and the intact periosteum.

The tissue is composed of large cavernous spaces filled with blood cells, which vary somewhat in size (Fig. 15). They are lined with a single layer of endothelial cells. Between some of the vascular spaces can be seen small collections of small round cells, undoubtedly lymphocytes. The stroma between the spaces is moderate in amount and consists of a loose fibrous connective tissue with a fair number of nuclei which are ovoid in shape and contain a moderate amount of chromatin. Nowhere can mitotic figures be seen.

Many small vacuoles are present in this connective tissue due to collection of fat. These apparently arise from the disintegration of cells, for about these areas can be seen some cells containing fat globules, so-called "foam" cells, and stages between these and complete disintegration are seen. There is also some hemorrhagic infiltration which is probably traumatic, resulting from the operation. There are no giant cells. A few spicules of necrotic bone can be seen; these are granular in character, stain purple and in some places are vacuolated. The structure of the bone is distinctly abnormal; there are no lacunae and no cells. No spicules of new-formed or proliferating bone are seen.

Discussion. The slow progress of the lesion in this case is clearly shown in both the roentgenograms and in the case history.

It is interesting to note the marked increase in density of the trabeculae and sharpness of the outline of the tumor after roentgen therapy. This process is apparently similar to that observed in giant cell tumors under treatment. Herendeen[22] describes the roentgen appearance of giant cell tumors one or two months

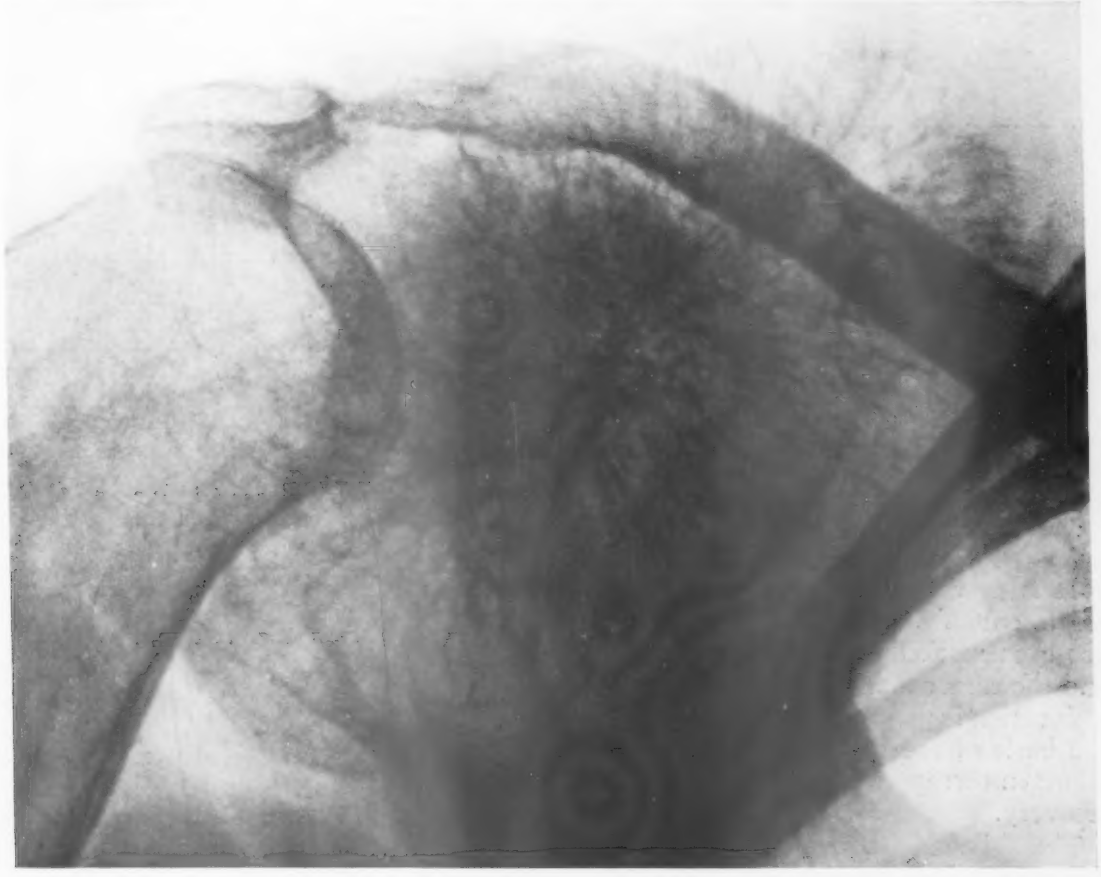


Fig. 14. Case II. Roentgenogram taken Feb. 11, 1929. Marked increase in the number and thickness of the bony trabeculae.

after treatment as follows: "Rapid enlargement of the tumor, with expansion of the cortex and thinning of the bony capsule of the tumor with hardly any outline of the tumor being visible . . . . this stage should never be mistaken for apparent increase in growth of the tumor. If, however, at the end of another month or two . . . . a roentgenogram is made it will be found that the tumor is becoming ossified . . . . and that there is present a well marked effort at a healing process."

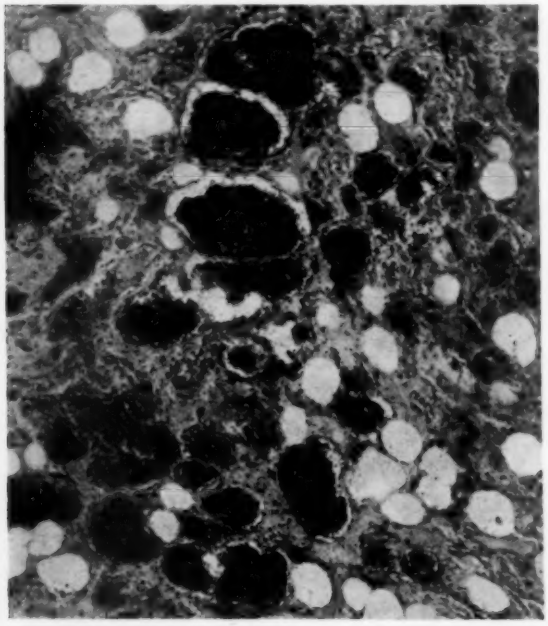


FIG. 15. Case II. Photomicrograph of tissue removed at biopsy. Numerous cavernous spaces filled with blood are seen. The amount of intervascular tissue is small. Hematoxylin and eosin (X 70).

It is now only nine months since the treatment of Case II was begun. There has been marked alleviation of symptoms and the tumor mass has decreased in size; ossification is progressing satisfactorily; on the basis of the results in Case III with roentgen therapy we anticipate a complete recovery.

The following case is very similar in many respects, especially the roentgenological appearance, to Case II.

CASE III. *Registry of Bone Sarcoma No. 153. Registered by Dr. A. H. Galvin, Anaheim, California. Case No. 12429. Tumor of left ilium. Biopsy with severe hemorrhage; treatment with Coley's serum and roentgen radiation. Recovery. Cavernous hemangioma of bone.*

On December 31, 1917, Mrs. J. T. H., white female, aged thirty-eight, consulted Dr. E. F. Stevenson of Waterloo, Iowa, because of pain in the left hip. The past history was irrelevant. There was no history of trauma. Pain began in the Fall of 1917 and became progressively worse. Examination in December demonstrated a swelling over the left ilium lateral to and above the left sacroiliac joint. The swelling was 2 to 3 inches in diameter and slightly tender. There was no loss in function and no pulsation. Except for these findings the physical and laboratory examinations were negative.

Roentgenograms taken on January 2, 1918, by Dr. J. W. Rowntree showed a tumor having the appearance of "being honeycombed, with trabeculae running through it." The tumor was quite regularly round.

Patient was then referred to Dr. A. D. Bevan of Chicago, who advised operation. This was performed in February, 1918. Numerous dilated vessels were encountered and the operative procedures were soon stopped because of severe hemorrhage. A small piece of tissue was removed for microscopical examination and the wound packed and closed. After a short interval, treatment with Coley's toxin and roentgen rays was instituted. Coley's toxin, 0.5 minim, increasing to 6 minims, was injected every other day, with roentgen therapy given twice a week. Coley's toxin was continued for six months; roentgen therapy for three months. No data are available regarding the details of these roentgen treatments.

In spite of severe reactions the patient showed marvelous improvement. Her weight increased from 98 pounds at the time of operation to 140 pounds in December, 1919; her normal weight.

Subsequently she was in good health and free from pain except for mild discomfort caused by exertion or damp weather.

Late in 1920 she moved to California and the old pain returned when she became tired. It was not as severe as formerly, however. She took four roentgen treatments (the data are

not available) which completely relieved her symptoms until about November 1, 1921. Pain then developed in the left hip, which became progressively worse so that she consulted Dr. A. H. Galvin of Anaheim, California, on December 29, 1921. At that time roentgen examination revealed a tumor of the left ilium.

Roentgen-Ray Examination: December 29, 1921 (Fig. 16). "Plate shows a bony tumor of oval shape (roughly 11×14 cm. on film), involving the medial portion of the left ilium. It does not appear to involve the sacroiliac joint, sacrum or the hip joint or any part of the fifth lumbar vertebra. Enlarged bony tra-

Fig. 16. Case III. Roentgenogram taken Dec. 29, 1921, over four years after the onset of symptoms. Note the many fine bony trabeculae radiating from about the center of the neoplasm. Cf. Figures 14 and 15.

beculae pass radially from the center of the tumor in all directions. The central trabeculae are apparently at right angles to the plane of the bone. The superior and medial portions of the tumor are indistinct, as is also the medial part of the ilium forming the greater sciatic notch."

She was given four roentgen-ray treatments as shown on page 17.

(We are unable to properly evaluate the above dosage in R-units).

Roentgen-Ray Examination: February 23, 1924 (Fig. 17). "Plate shows particularly the regeneration of the cortex of the greater sciatic

FIG. 17. Case III. Roentgenogram taken Feb. 23, 1924, two and a quarter years after Figure 16. Marked increase in density and thickness of the trabeculae; also in the cortex of the tumor, especially in the region of great sacrosciatic notch.

Date	Spark Gap	Current	Time	Filtration	Focal Skin distance	Area
Jan. 5, 1922	9 "	5 ma.	10 min.	6 mm. Al+sole leather	9"	Left iliac ant. 1 area
Jan. 9, 1922	9½"	5 ma.	10 min.	5 mm. Al+sole leather	9"	Left iliac ant. 4 areas
Jan. 12, 1922	9½"	5 ma.	10 min.	5 mm. Al+sole leather	9"	Left iliac post. 4 areas
Feb. 14, 1922	9½"	5 ma.	10 min.	6 mm. Al+sole leather	9"	Left iliac ant. 1 area

notch and the superior margin of the wing of the ilium. The limits of the bony tumor are now seen. The bony trabeculae are very dense.

In October, 1924, the patient reported in excellent condition and was having no pain. The swelling had completely disappeared. In July, 1927, the patient was last heard from and at that time her condition was reported as excellent.

Microscopical Description: Microscopically the tissue is largely composed of cavernous spaces containing erythrocytes (Fig. 18). These spaces for the most part are lined by a single layer of perfectly normal flat endothelium. The walls of many of the spaces are thrown into numerous folds. The intervening tissue is loose and acellular and is somewhat edematous in some portions. The cells are spindle cells, probably fibroblasts, and between them lie numerous fine fibrils. A few small areas of lymphocytes are seen as in Case II. There are a few small spicules of bone to be seen. One of these is markedly necrotic. It has become very granular, the lacunae and cells are no longer present, large defects have appeared in it and the edges are ragged. Nearby is another more slender spicule of bone. It is quite cellular and its margins are covered by numerous osteoblasts. Bone necrosis and formation may both be seen in the same spicule, necrosis on one side and osteogenesis on the other.

Discussion. This case apparently demonstrates that the roentgen rays can be used successfully to cause fibrosis and ossification in the tumor, as was shown by Herendeen[22] in the case of giant cell tumors. Codman suggests that following roentgen therapy the osteoblastic activity of the cells predominates so that osteogenesis occurs and osteolysis ceases. It has also been quite generally proved that the endothelium of the vascular channels is injured by roentgen rays leading to fibrosis or even to obliteration of their lumina.

Case IV is also an instance of involvement of a flat bone At first sight it does not seem to resemble the two preceding

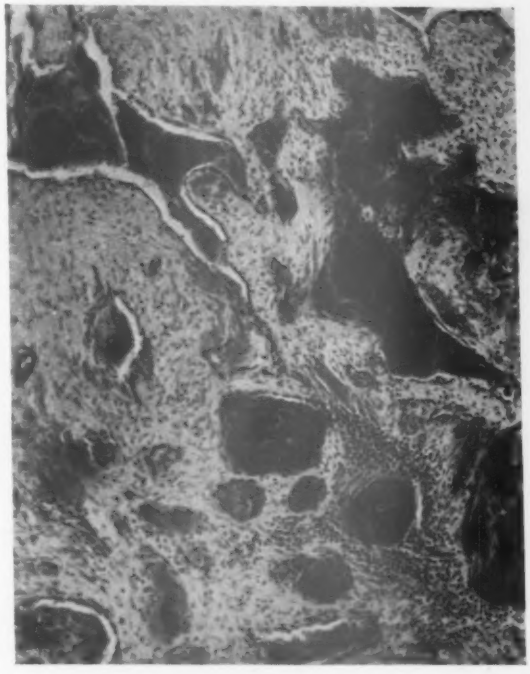


Fig. 18. Case III. Large dilated venous sinuses are seen. The intervascular tissue is greater in amount than is usually seen. Note the collection of lymphocytes in the lower right-hand corner. Hematoxylin and eosin (X 85).

cases, but, as we shall point out, close scrutiny reveals a decided similarity. Cushing[9] reported this case in 1923 and a brief résumé will suffice here.

Case IV. *Registry of Bone Sarcoma No. 230. Registered by Dr. Harvey Cushing, Boston, Mass. P.B.B.H., No. 10669. Tumor of left parietal bone; removal by operation; complete recovery; cavernous hemangioma.*

Patient, J. M. C., white female, aged fifty-five, was admitted to the Peter Bent Brigham Hospital in June, 1919, because of a dome-shaped prominence in the left parietal region. Five years previously she had bumped her head severely at this particular spot. The area had remained tender and in the course of a year a swelling appeared which had gradually increased in size. "The x-ray, however, did not tend to confirm the bedside diagnosis (meningioma) for there was a well-outlined patch of rarefaction corresponding to the bony protrusion which was variously interpreted as due to a possible cholesteatoma, gumma, sarcoma or bone cyst."

FIG. 19. Case IV. Roentgenogram of the removed osteoplastic flap. Numerous radiating fine trabeculae are seen.

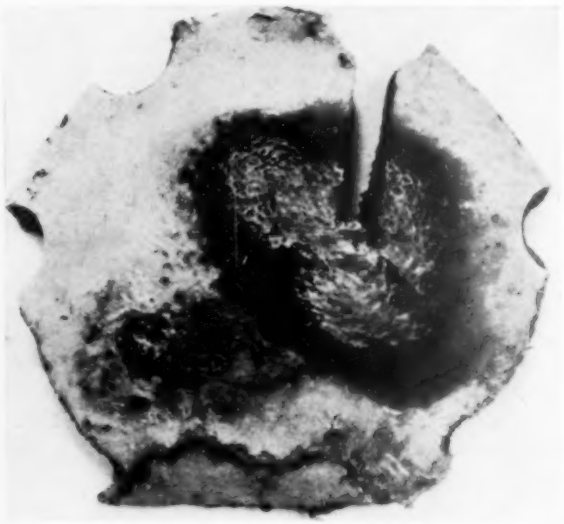


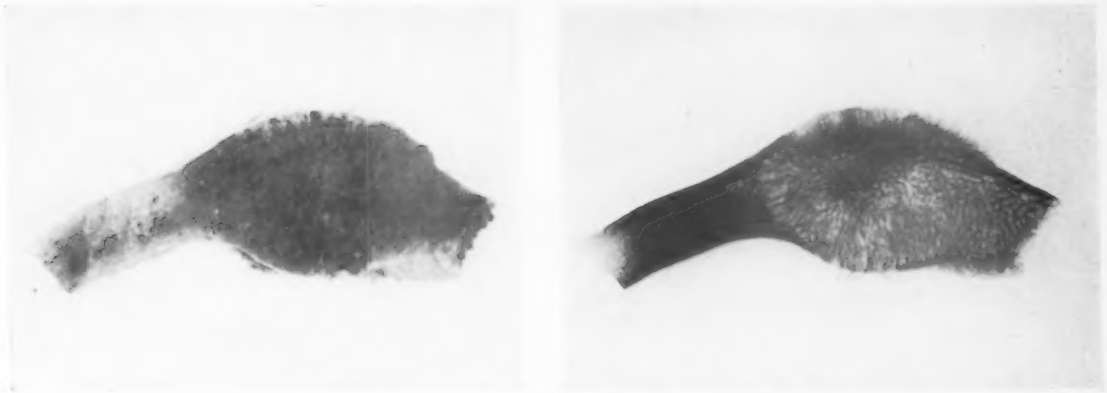
FIG. 20. Case IV. Photograph of external surface of the osteoplastic flap. Note the dark color of the tumor and the pitted surface.

At operation an osteoplastic flap was turned back including the tumor. It was a peculiar purplish-black in color and thought to be a melanoma. The scalp was stripped back from the bone, the latter removed, and the wound closed. The patient made an uneventful recovery and was in perfect health when last heard from in November, 1927, over eight years after operation.

Roentgenogram of Specimen (*Fig. 19*). The cortex is thinned and raised both on the outer and inner tables, with marked accentuation of the diploetic spaces to a "honeycomb" appearance. The growth is expansive radially, but mostly at right angles to the plane of the bone. It has none of the characteristic appearances of a meningioma, which are described by Sosman and Putnam[43]. The roentgenogram of a section of the tumor (Fig. 21*b*) shows this same fine bony network.

Gross Description. The bone removed (Fig. 20) contained in its middle portion two hillock-shaped tumor growths, purplish-black in color, which caused prominences on both the external and internal surfaces. The prominences are covered by small pits. The larger is about 3.5× 2.5 cm. in size, and is raised about 1 cm. in height above the surrounding bone. The thickness of the involved area is well shown in a section taken from the tumor (Fig. 21*a*). As in the other cases it will be noted that though the bone itself has been invaded and more or less destroyed, the periosteum remains intact and has only been elevated by the growth of the tumor.

Microspical Description. A section through the tumor and an adjacent area of apparently normal bone reveals cancellous bone which in the involved area is composed of thin bony trabeculae which enclose unusually large intertrabecular spaces. The spaces are filled with very large vascular sinuses which contain blood (Fig. 22). Sometimes as many as three or four



a *b*

Fig. 21. Case IV. *a*. Cross section of hemangioma of skull. Actual size. *b*. Roentgenogram of specimen showing almost complete destruction of normal bone with replacement by tumor, showing numerous fine radiating spicules of bone. Compare with Figures 14, 16 and 19. (Specimen obtained through the courtesy of Dr. Cushing.)

such sinuses may occupy one intertrabecular space, while in other instances the entire space may be occupied by one enormous channel. Some of these are from 1 to 2 mm. in diameter.

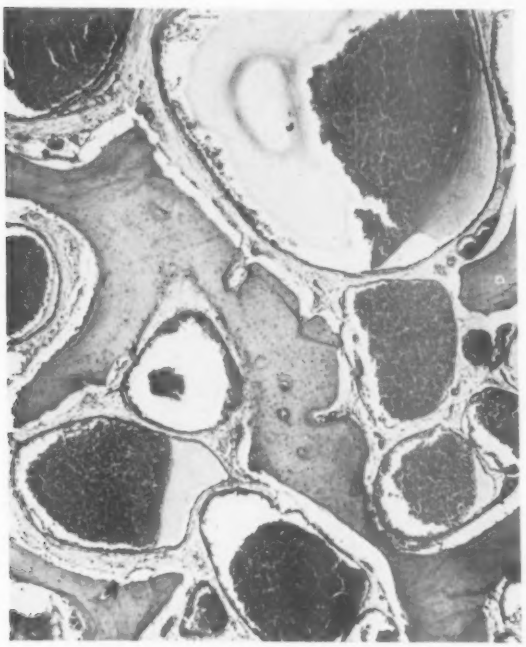


Fig. 22. Case IV. Hemangioma of skull. Vascular channels much larger than in any of the other cases. Note the small amount of supporting connective tissue. Hematoxylin and eosin (X 30). (Specimen obtained through the courtesy of Dr. Cushing.)

These sinuses are lined by a single layer of flattened endothelium. For the most part there is no or at least very little supporting connective tissue framework and the endothelial lining seems to lie in direct contact with the bony trabeculae. However, near the surface of the tumor the individual sinuses are surrounded by a layer of very loose connective tissue which separates them from each other and from the surrounding bone.

In the midst of the involved area where the bony trabeculae are very thin no osteoblasts nor osteoclasts are to be seen. However, in some areas, especially near the surface, the trabeculae are of normal size or larger and here the surface of the bone is covered by a layer of osteoblasts. In the apparently uninvolved area the trabeculae are of usual size and the intertrabecular spaces are filled with a mixed cellular and fatty marrow. There is no appreciable amount of adipose tissue to be found about the vascular sinuses, nor are any necrotic spicules of bone seen.

Discussion. This case presents, as do the others, a history of rather long duration. The roentgenograms reveal a picture of radiating trabeculae which is almost a miniature of the roentgenological appearance of Cases II and III. Sosman[42a] describes it as "a fine honeycomb or network of beautiful detail."

FIG. 23. Case v. Hemangioma of clavicle. Photograph of specimen, actual size. The tumor is covered by a capsule which is continuous with the periosteum of the shaft.

FIG. 24. Case v. Cut surface of tumor (broken with saw in upper left corner). Numerous bony spicules throughout. Capsule of periosteum intact.

Case v is a typical case of cavernous hemangioma of bone. As it has been only briefly presented by Phemister[35] we are furnishing a more detailed review here.

CASE v. *Tumor of sternal end of right clavicle. Excision of inner end of clavicle. Complete recovery without recurrence. Cavernous hemangioma.*

The patient, M. McM., Case No. 173, a female, aged forty, was admitted to the Presbyterian Hospital of Chicago on the service of Dr. D. B. Phemister in February, 1916. Two years before she had noted a small swelling at the inner end of the right clavicle. This gradually increased in size and became increasingly painful and tender. However, the discomfort was never great. Examination revealed only a tumor mass firmly attached to the inner end of the clavicle, which was tender. There was no pulsation or bruit present. On February 7, 1916, the patient was operated upon, and the inner two-thirds of the clavicle containing the tumor was excised. An uneventful recovery followed; the patient when last examined eleven years after operation showed no evidence of recurrence and was entirely free from symptoms.

Gross Description. The specimen (Figs. 23 and 24) consists of the inner half of the right clavicle which has been expanded by a large tumor mass which has arisen from and completely replaced the sternal end of the bone. The tumor measures 4.5×7.5×5.5 cm. It is reddish brown in color and of bony hardness. It seems to consist of a soft tissue containing many fine bony trabeculae which give the tissue its consistency. The tissue is covered with a fibrous capsule which is continuous with the periosteum of the shaft of the bone; the tumor extends for a short distance into the marrow cavity of the bone.

Fig. 25. Case v. Roentgenogram of specimen. Numerous fine radiating spicules. Almost intact sternal end of clavicle.

Roentgenogram of Specimen (*Fig. 25*). The numerous trabeculae which apparently radiate in all directions are particularly well shown in this case. While the sternal end is enlarged, it has not been destroyed to the extent that the shaft has, just lateral to the epiphyseal line. From the gross description as well as the roentgen evidence the tumor is seen to be encapsulated. The periosteum is lifted beyond the limit of cortex-destruction and is everywhere intact.

Microscopical Description. The tissue is made up of many large cavernous spaces, all of them filled with blood cells (Fig. 26). They vary somewhat in size and a few enormous spaces are seen. They are lined with a single layer of flat endothelium. The amount of intervascular tissue is very small for the most part, though in some few areas it is moderate in amount. It consists of a relatively acellular and very loose connective tissue resembling areolar tissue. There are no cells in this tissue other than the usual spindle and stellate connective tissue cells.

There are many spicules of bone present throughout the substance of the tumor. None of these show absorption or necrosis. They consist mostly of new-formed bone and are covered by a layer of osteoblasts. Wherever a section is cut through the periphery of the tumor a definite periosteum can be seen over the surface and immediately beneath it a thin layer of newly formed bone.

Discussion. This specimen is particularly interesting in that the roentgenogram shows so very clearly the radiating character of the fine bony trabeculae within the tumor which is so characteristic of the cases classified as Type I. In this regard it bears a very close resemblance to Cases II and III. In addition the roentgenographic interpretation that the periosteum is intact and is stretched over the surface of the tumor is borne out by the gross and microscopic examination of the specimen. The cortex of the bone has been destroyed, as we have seen in the other cases and which will be particularly well shown in Case VI.

It should also be pointed out that the roentgenological appearance of this case differs from that in other cases of heman-

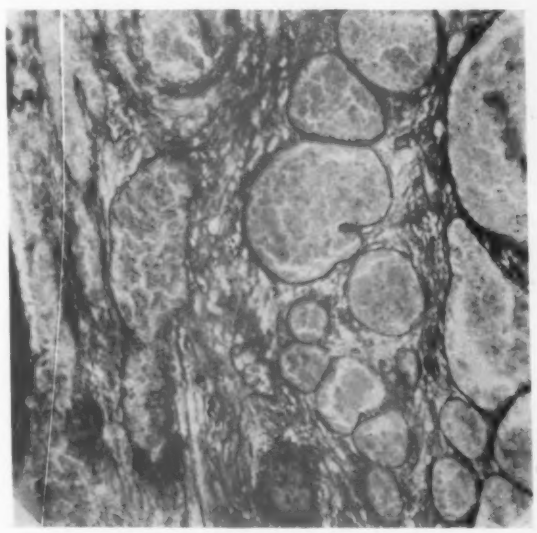


Fig. 26. Case v. Hemangioma of clavicle. Large cavernous spaces filled with blood. Moderate amount of intervascular connective tissue. Hematoxylin and eosin (X 110).

giomas in long bones in which roentgenograms are available, namely Case VI, ulna, and the case reported by Hitzrot, humerus. In both of these the growth presented a loculated appearance, while in this case the picture of bony trabeculae radiating from a common center, as seen in flat bones, is presented.

The microscopic picture presented here is very similar to that seen in Case I (Fig. 5), in that the vascular sinuses are large and are separated by a very little loose connective tissue.

We believe it is also worth while to emphasize again the relative chronicity of the course in these cases. The gradually progressive development of symptoms occurred over a period of two years.

The excellent results which follow complete removal of these neoplasms is well demonstrated here as in Case IV and also in Case VI. When this patient was last seen, over eleven years after operation, she had complete relief from all symptoms, excellent function of the extremity and no evidence of a recurrence.

Type 2. Cases VI and VII involving a long bone, the ulna, and an irregular bone, the scaphoid, show a second type of roentgen appearance. In Case VI there is nothing in the clinical history or physical examination on which to make a diagnosis of hemangioma.

FIG. 27. Case VI. Roentgenogram of hemangioma of the ulna. The loculation is striking as well as its location near the epiphysis. Compare with Figure 1.

CASE VI. *Registry of Bone Sarcoma No. 849. Registered by Major R. Callender, Army Medical Museum, Washington, D. C. Tumor of right ulna; excision; complete recovery; capillary hemangioma.*

Patient C. C., Case No. 267,953,* a white male, aged twenty, was admitted to the Ancon Hospital, Canal Zone, on September 24, 1926, complaining of a swelling over the medial aspect in the lower portion of the right forearm, of eight months' duration and a dull ache in this region aggravated by exertion. The patient gave a history of having frequently sprained the wrist, perhaps fifty times. Eight months prior to admission he had been struck on the right wrist with a bolo knife handle. This resulted in pain, tenderness and discoloration which persisted until the time of operation. The swelling began seven months after the injury, increased in size and became harder.

General physical examination was negative except for the right forearm. Roentgen examination of chest revealed nothing of importance. Examination of the right forearm revealed on the medial surface of the lower third of the ulna just proximal to the styloid process a hard, smooth swelling which was slightly tender.

Roentgen-Ray Examination. September 24, 1926 (Fig. 27). Fusiform swelling of the lower

* This case was originally studied and diagnosed by Major Paul E. McNabb, who reported it to the Army Medical Museum, and who has very kindly permitted us to report it here.

third of the right ulna, sharply demarcated by the lower epiphyseal line. The periosteum is intact everywhere; the tumor is central and expansive. The cortex is irregularly eroded; its remains extend into the tumor growth. The loculations are of small size and irregular shape, with a fine, trabeculated appearance. The roentgenographic appearance resembles closely that reported by Hitzrot (Fig. 1).

Operation. On September 27, 1926, the lower third of the right ulna with the tumor mass was excised, taking care to try to preserve the articular surface of the ulna and some periosteum. There was an uneventful recovery except for a small bleeding sinus which had healed by

Fig. 28. Case VI. Roentgenogram six months after subperiosteal resection of the hemangioma. There has been considerable regeneration of bone but no evidence of recurrence.

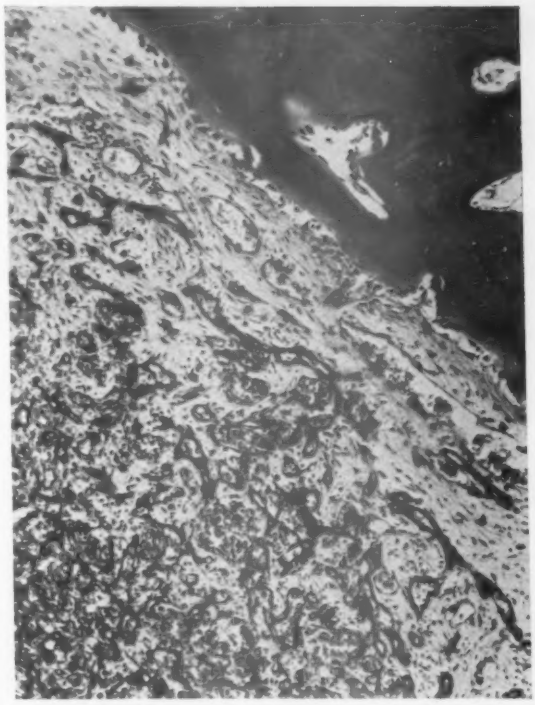


Fig. 29. Case VI. Capillary hemangioma of the ulna. Small amount of intervascular connective tissue. Note the layer of osteoblasts along the surface of the bone. Hematoxylin and eosin (X 85).

November 11, 1926. The functional result was excellent, and the patient was in perfect health when last seen on August 4, 1928. Roentgen examination March 25, 1927 (Fig. 28) reveals partial reformation of the ulna and no evidence of recurrence. The epiphyseal line is fused, with no invasion of the lower epiphysis by the tumor.

Microscopical Appearance (*Fig. 29*). The tissue is composed of numerous vascular spaces, most of which contain blood; many of them appear to be of the caliber of capillaries, others are definitely cavernous spaces. The lining of the large spaces is a thin endothelial layer, one cell in thickness. The lining of many of the capillary spaces shows a moderate amount of endothelial proliferation with the result that it is often two or three cells in thickness. The cells lining these spaces are larger and less flattened than normal endothelium. The intervening connective tissue stroma is unusually loose and acellular. It has the appearance of loose areolar tissue; the nuclei are ovoid and contain only a small amount of chromatin.

The bone in many cases shows evidence of proliferation, the margins being covered with numerous osteoblasts. No areas of bone destruction and no osteoclasts were seen in the available material.

Discussion. This is the only case of capillary hemangioma in the series. It seems to be a type of lesion rarely found in bone. The cases reported as capillary hemangioma of bone by Nauwerck[31] and Ballance and Shattock[2] are undoubtedly of the cavernous type. Of particular interest in this case is the surgeon's note that the periosteum was intact, thus enabling him to do a subperiosteal resection and permitting regeneration of bone subsequently (Fig. 28). This is in support of our contention that although as a rule the hemangioma destroys the cortex of the bone it elevates the periosteum but does not break through it. In this case it will again be noted that the lesion lies near the epiphysis as was pointed out by Hitzrot[23] to be the rule in cases of hemangioma of long bones.

The roentgenological appearance is typical of this type of lesion and is very comparable to that in the case reported by Hitzrot (Fig. 1) as well as in Case VII.

In Case VII there was pain apparently associated with impaired circulation to the part. The point is interesting but probably not of diagnostic value. It is to be noted also that the gross appearance of the tissue was not quite the same as in the other cases and that the surgeon does not mention profuse hemorrhage occurring at operation, as in Cases I, II and III. There is nothing in the microscopical examination of the tissues available to explain these differences.

CASE VII. *Registry of Bone Sarcoma No. 249. Registered by Dr. A. P. Ashhurst, Philadelphia, Pa. Tumor of scaphoid bone, right foot; curettement; complete recovery; cavernous hemangioma.*

Patient, V. D. A., white male, aged thirty-five, consulted Dr. Ashhurst in September, 1922. In February, 1921, he had noted that his right foot and ankle felt as though they had been sprained, but he had no knowledge of injury. During the summer of 1921 he had no disability but in October he again suffered with pain in his right foot. Following an attack of tonsillitis in the early summer of 1922 the pain became worse. His disability steadily increased. The pain became acute and the patient was unable to sleep. For some months he had been unable to wear golf "knickers" because the constriction about the knee caused severe pain in the foot.

Physical examination in September, 1922, was negative except for the right foot, which showed a prominence on the median border of the scaphoid, so tender that it could scarcely be touched. The other bones of the foot seemed normal.

FIG. 30. Case VII. Hemangioma of tarsal scaphoid. Expansion of cortex. Distinct loculation of the tumor. Loculi crossed by numerous fine bony trabeculae.

*Roentgen-Ray Examination** (Fig. 30). "Multiple cyst-like appearance of the medial third of the tarsal scaphoid of the right foot. Cortex slightly expanded and thinned; normal trabeculae replaced by numerous small loculi. No change in the articulating surfaces with astragulus or cuneiform bones."

Operation was performed September 16, 1922.

* Codman[6] mentions this case.

The periosteum of the scaphoid bone bulged medially and the underlying bone felt cystic. On incising the periosteum a tissue resembling currant jelly was found, and very friable bony trabeculae were seen passing through it. This tissue was all curetted out. The process seemed limited to the scaphoid bone; the cavity was packed with iodoform bone-wax and the incision closed.

The patient made an uneventful recovery except for the discharge of a small amount of wax from the wound. When last heard from in August, 1928, he was entirely free from symptoms except for a slight ache in damp weather.

Microscopical Description. The tissue is composed of many cavernous spaces of varying size (Fig. 31). They are lined by normal-appearing endothelium. Many of them contain erythrocytes; many are empty.

The intervening tissue is loose in texture and composed of spindle and round cells with many fibers. This is just a loose connective tissue framework and there are no mitotic figures. There are many small vacuoles as in Case II and a few cells showing fatty degeneration. Considerable brown pigment is also present. It appears to have come from degenerated erythrocytes.

A few blood vessels in the section show a marked intramural connective tissue proliferation, resulting in a very thick wall and a comparatively small lumen.

The few spicules of bone present show no change from the normal.

Discussion. This case is unusual in that there was an apparent expansion of the cortex rather than an erosion as in the other cases. The roentgenological appearance of a loculated tumor cannot be differentiated in this case from that of giant cell tumor. In all other cases this was accomplished with relative ease principally because a giant cell tumor produces an expansion of the cortex of the tumor and no new bone formation within, while hemangiomas as a rule erode the cortex and grow subperiosteally (cf. Figs. 1, 13, 16, 24 and 27). In addition the loculi in cases of hemangioma of the long bones usually present numerous fine bony trabeculations which are never seen in giant cell tumors.

We wish to include here one other case, Case VIII, from the Registry of Bone Sarcoma, which seems to belong to this group, but as the roentgenograms are not available, the clinical reports incomplete, and the histological preparations inadequate, we do not feel able to confirm the diagnosis. The patient could be followed for only two and a half years after treatment, but at that time there appeared to be complete recovery. This fact tends to support the diagnosis of hemangioma, for the treatment was hardly sufficient to have arrested a malignant lesion.

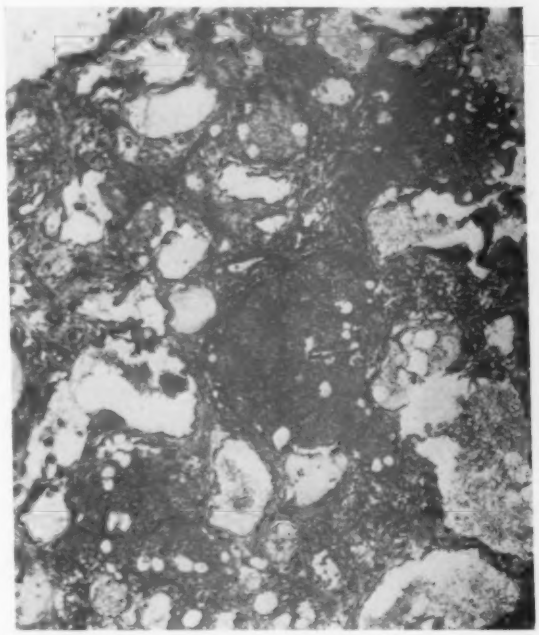


Fig 31. Case VII. Hemangioma of tarsal scaphoid. Large dilated cavernous spaces filled with blood cells. Small amount of connective tissue between vascular spaces. Hematoxylin and eosin (X 85).

Case VIII. *Registry of Bone Sarcoma No. 355. Registered by Dr. James Ewing, New York City. Tumor of internal condyle of right femur. Radium packs and curettement; complete recovery.*

There is no clinical history available. Patient D. R. L., a female, aged twenty-six, had a roentgen examination on March 16, 1921,

which revealed "an area of bone destruction in the internal condyle of the right femur. It had destroyed a portion of the cortex on the internal side and had not produced much expansion of the medullary canal. It had grown almost equally in all directions regardless of the resistance of dense bone anteriorly and internally. Only a thin layer of cortex remained. Some attempt at limitation had occurred, there being some bone production in the periosteum."

Treatment. On March 15 and 16, 1921, the patient was treated with radium packs. Roentgenograms taken on March 29 and April 17, 1921, revealed no change. On April 18, 1921, the area was curetted.

On November 1, 1923, patient was reported to have made a complete recovery. Roentgen examination at that time revealed the cavity completely filled with new bone. She has not been heard from since.

Microscopical Description. The tissue is composed of numerous cavernous spaces containing erythrocytes and lined by normal endothelium. The connective tissue walls are thick and more cellular than usual. Between these vascular spaces is a loose, relatively acellular, connective tissue.

There are numerous spicules of bone. Some of them are definitely necrotic, some showing absorption and some bony proliferation.

Discussion. The description of the roentgenological appearance of this lesion seems to fit into the picture which we have presented here in some respects. The destruction of the cortex of the bone with growth of the lesion beneath the periosteum is undoubtedly characteristic of these neoplasms. The excellent results from the therapeutic measures employed certainly speak for a benign lesion.

Dr. Ewing, who has had much the best opportunity to study the histological preparations from this case, believes that it is a cavernous hemangioma. Practically all members of the Committee on Bone Sarcoma felt that this was the most probable diagnosis.

The case is presented here largely for the sake of completeness in our attempt to report all of the verified cases of hemangioma in the Registry up to date.

DISCUSSION

In order to make this study as valuable as possible we have attempted to collect all the hemangiomas of bone which have have been reported in the literature. These cases have been arranged in tabular form (Table IV). In drawing the following conclusions we have followed the data available from the reported cases as well as those which we have recorded in this paper.

Except for cases untreated for a few years (as in Case II) bone tumors of this type present no clinical points to differentiate them from other tumors of bone. The course of the disease, where we have an opportunity to observe it, is chronic and so the lesion is classified as benign, but in most cases the onset of the symptoms is rather acute, and as soon as a roentgen examination has demonstrated a bone neoplasm an operation is usually performed.

In reviewing the cases in the literature as well as the cases here presented one is impressed with the frequent relation between the onset of symptoms and definite trauma. This does not hold for hemangioma of the vertebrae and is not recorded in Case III or VI. Although in the majority of the cases there is history of definite trauma followed immediately by pain, tenderness and frequent swelling, we do not believe that there is any supportable evidence that the injury has any relation to the etiology of these cases.

Physical examination of the lesion itself seldom if ever differentiates this tumor from others. In a few cases, however (Mauguière,[28] Schöne,[40] Zajaczkowski[53] and others), the periphery of the tumor presents an area of bony hardness raised above the level of the surrounding bone, while the center is soft and pulsating. This may be characteristic of hemangioma of bone. Apparently it is this finding which has

caused confusion between the so-called "aneurysm of bone" and hemangioma.

In the cases in the literature and those reported here the majority of patients were between thirty and fifty years of age. Cases were found in subjects as young as four months and as old as seventy-six years. In these two extremes cited the lesions were in the skull. It will be recalled that Makrycostas found a hemangioma of the vertebrae in the body of a subject ninety years old.

As we previously noted, hemangioma of the vertebrae is more common in females than males, while hemangioma of bones other than the vertebrae is more common in males than females (13 to 8). We know of no explanation for this other than that

TABLE IV

HEMANGIOMA OF BONE

Other than Vertebrae

Author	Sex	Age	Location	Treatment	Result	Remarks
Nauwerck[31]	M	57	Femur, lower end	?	?	
Schuh[41]	F	18	5th metacarpal	disarticulated	?	
Birch-Hirschfeld[3]	F	31	Phalanx	?	?	Mixed chondroma and angioma
Travers[49]	M	10	Clavicle	removal of clavicle	recovery	Followed trauma
Mauguière[28]		16	Clavicle, left	removal of clavicle	recovery	Tumor pulsated
Cruveilhier[7]	F	56	Ilium, sacrum, 4th and 5th L vertebrae	?	?	Autopsy finding
Verneuil[51]	M	young	Scaphoid (tarsal)	amputation	?	
Stanley[45]	M	boy	Mandible	?	?	
Moltrecht[29]	M	16	Horizontal ramus of mandible	resected	?	
Lücke[25]	F	26	Maxilla	extirpation	?	
Pean[32]	M	50	Hard palate	removed	no recurrence	
Robin[36]			Hard palate	?	?	
Schöne[40]	M	39	Left occipital	excised	recovery	Tumor limited to bone. Center pulsated
Toynbee[47,48]	M	19	Parietal bones	?	?	Died of tuberculosis
Ehrmann[13]	F	40	Left parietal bone	removed	died	Meningitis
Zajaczkowski[53]	F	38	Frontal bone	extirpated	recovery	Pulsated in center
von Rokitanski[37]	—	—	Parietal bone	?	?	

TABLE IV (*cont.*)

Author	Sex	Age	Location	Treatment	Result	Remarks
Ziegler[54]			Skull	?	?	
Cruveilhier[8]	F	38	12 tumors in skull, femur, 3d rib, both shoulders	?	?	
Kaufmann[24]	M	76	Skull	?	?	Autopsy
Major and Black[26]	M	34	Left frontal, right temporal bones	Patient died of	massive angioma of liver	Also bilateral cystic adrenals
Brandt[4] (Von Hippel's case)	M	47	Left petrous bone	Necropsy finding		Angioma of retina right eye, cerebellum left lobe, cauda equina, both kidneys, pancreas, spleen and in bones (?)
Stamm[44]	F	4 mo.	Skull	Necropsy finding		Angioma of skin muscles, bone (?) kidney, ovary, lungs, and brain
Erös[13a]	F	70	Frontal bone	Necropsy finding		Multiple small hemangiomas of other cranial bones
Hitzrot[23]	M	25	Right humerus, upper end	Excision	Recovery	Father, "blood tumor" right humerus
Ballance and and Shattock[2]	M	37	Left humerus, medullary cavity	Excision	Poor function. No recovery	X-ray shows absorption of cortex of bone. Pathological fracture
Furlkröger[16]		23	Astragulus and os calcis	Excision	Recovery	Congenital
Pohl[35a]	F	56	Right tibia	Amputated	Recovery	Typical x-ray appearance

Bregman and Mesz[5] reported a case of hemangioma involving the skin, occipital bone and occipital lobe. The point of origin was very uncertain. We have found in the literature 3 other cases, the pathological nature of which is doubtful. Renton and Teacher[35b] reported a "malignant angioma" of the shaft of the tibia occurring in a man sixty-five years of age. However, the histological description and the photomicrograph throw considerable doubt on this diagnosis. It is impossible to classify from the description and illustrations the case of "angio-endothelioma of the foot" reported by Narath[30a]. The tumor involved the malleoli, the astragalus, the os calcis, the cuboid, the 3d and 4th metatarsals, the navicular bone and the medial cuneiform. We were unable to secure the original of the article by Torri[48a]. The abstract which appeared in *Centralbl. f. Chir.* is not sufficiently detailed to determine whether the angioma involved the bones or only the soft tissues.

the number of cases of hemangioma of bones other than the vertebrae is too few to permit the drawing of any conclusions in this regard.

Two groups of bones of the body are most frequently the site of hemangioma; the vertebrae and the skull. The frequency of hemangioma of the vertebrae has been mentioned in the paper of Töpfer. Involvement of the calvarium is

reported in 12 cases including the case reported here, the parietal bones being involved more often than the others. Instances are recorded of involvement of other bones of the skull, the mandible, maxilla and petrous portion of the temporal bones; in the group of 33 cases of hemangioma of bones other than the vertebrae, 18 are cases of involvement of some bone of the skull. The remaining 15 cases are of miscellaneous bones of the skeleton, no one of which has been involved more than twice, with the exception of the clavicle.

Roentgen-Ray Examination. The roentgen appearance of hemangioma cavernosum of a flat bone (Type 1) is characteristic of the lesion. One long bone, the clavicle (Case v) also belongs to this group. There are strikingly large, numerous, "sunburst" trabeculations arising in a common center and radiating out from the plane of the bone. *The cortex of the bone is frequently destroyed but the periosteum remains unbroken, though it may be greatly expanded* and forms a thin bony shell about most of the extent of the lesion. The question which most commonly arises is: how can this roentgenological appearance be differentiated from that of osteogenic sarcoma? In early cases of osteogenic sarcoma where the cortex of the bone is still intact the roentgenological appearance is practically always one of a loss of bone density as compared with hemangiomas in which numerous fine trabeculations are present. Subsequently osteogenic sarcomas destroy the cortex of the bone and *invade the periosteum and surrounding soft tissues.* The periosteum does not act for any length of time as a retaining capsule in these cases as it does in hemangioma of which there are no known cases of extension of the tumor beyond the periosteum. It is true that when sarcomas pass beyond the cortex they produce numerous fine bony spicules, but these do not radiate from a common center as we see in hemangioma but rather *radiate from the remains of the cortex of the bone* which appears as their base. In addition several writers (Codman,[6] Haas[21]) have emphasized that in the roentgenograms of osteogenic sarcoma the outlines of the shaft of the bone can practically always be seen, while in hemangioma of bone the cortex is usually almost completely destroyed.

In the bones of the skull the lesion must be differentiated from the bony change produced by a meningioma. The latter shows increased vascularity and occasionally erosion of bone. In about 25 per cent of the cases of meningioma hyperostosis is present (Cushing[10]). This is characterized by a bony thickening and spicule formation which is evident on roentgen examination. None of these characteristics are present in the roentgenograms (Figs. 19 and 21*b*) of Case IV. The fine trabeculation present in that case might be confused with the spicules seen in cases of hemicraniosis, though the resemblance is very slight.

In cylindrical bones, the gross roentgen appearance may resemble that of giant cell tumor. Careful comparisons show that the loculations are somewhat smaller, as Codman and Haas point out, and within them there is a fine fibrillary framework, as Pohl[35a] has noted in his case. The cortex usually is not expanded as in bone cyst or giant cell tumor, but is partially eroded. It may extend into the central expansive portion of the tumor as in Figure 27. The periosteum is considerably elevated beyond the level of the cortex but remains intact. This fact has previously been noted by Pohl. The tumor may extend down the marrow cavity.

There has been only one reported case of fracture through the tumor growth, that of Ballance and Shattock.[2] The roentgenogram in that case shows marked cortical absorption only, and is totally unlike that of any case in this series. We have seen no case in which the roentgen appearance was like that of the case reported by Ballance and Shattock, and are totally at a loss to explain it.

We have no evidence to explain why hemangiomas of long bones arise near the

epiphyses. This finding is in accord with Hitzrot's[23] earlier suggestion that such would probably be the case. However, in Cases II and III (in flat bones) the lesion seems to have arisen near the point of entrance of the main nutrient vessels. In the case of Hitzrot (humerus) the tumor is reported to have arisen from the humeral head just above the epiphyseal line, at which point numerous vessels are known to enter the bone. The two cases in long bones (clavicle and ulna) presented in this report also arose near the epiphysis but apparently from the shaft. It is possible that the development of these neoplasms is related to the epiphyseal vessels but it would seem likely that if this were the sole factor the area about the main nutrient vessels in the center of the shaft would be most frequently involved.

Microscopical Examination. With the exception of Case V, which is a capillary rather than a cavernous hemangioma, there is a remarkable similarity in the microscopical pictures presented. All the tumors are composed for the most part of large cavernous spaces which are usually filled with blood cells. The only variation is in the amount and character of the stroma. It varies in amount from practically none in Cases I and IV to a considerable amount in Case III. In all of the cases it is of the nature of a loose fibrous connective tissue. Many spindle cells with oval nuclei which contain a small amount of chromatin are seen. Mitotic figures are never seen. Cells of other types are also seen in some of the cases. Small nests of lymphocytes, usually surrounding one of the vascular spaces, are occasionally present. In several cases cells whose cytoplasm is swollen and largely occupied by vacuoles are seen. These are the so-called "foam cells" and apparently are merely cells which are undergoing fatty degeneration. This is further borne out by the fact that careful examination reveals many similar cells whose nuclei are pycnotic and whose cytoplasm is perfectly clear, having all been replaced by fat. These cells, both the "foam cells" and the more degenerated cells, are commonly found about areas which are acellular for the most part, but which contain many vacuoles apparently caused by fat globules which have resulted from further disintegration of the cells.

In one case many mononuclear eosinophilic and basophilic cells were seen, often alone and often collected in nests. These are apparently myelocytes, the remnants of bone marrow which has been largely replaced by the hemangiomatous tissue. Similar cells were seen in the case of hemangioma of the cranium reported by Erös.[13a]

In some areas groups of true fat cells are seen. These are never prevalent enough to permit of the diagnosis of angiolipoma as in some of Töpfer's cases.

The spicules of bone which are seen in all cases show two distinct changes, bone proliferation and bone destruction. Many spicules containing numerous lacunae well filled with healthy cells are seen. The margins of such spicules are usually covered with a layer of osteoblasts. In one specimen there is a band of fibrocartilage which is showing definite ossification at the periphery.

Bone destruction consists of two types of reaction, absorption and necrosis. The absorption is shown by the many osteoclasts seen along some of the spicules. These almost invariably lie in a deep depression in the bone. Thin, apparently eroded and often fractured spicules are also seen.

Necrotic pieces of bone are quite common. They are purplish in color (in hematoxylin and eosin preparations), granular, vacuolated and contain no cells. The edges are very ragged.

We are of the opinion that these changes in the bone are merely the reaction of the bone to the hemangiomatous growth. This is borne out by a case which we have recently examined. The hemangioma apparently arose from the meninges and invaded the parietal bone. Microscopically, however, the same osseous changes of absorption and osteogenesis can be seen as in cases of true hemangioma of bone. This

would seem to indicate that these changes are the result of the ingrowth of the hemangioma into the bone regardless of its origin and that they are not characteristic of hemangioma arising in bone.

It is to be noted that all of these cases are benign neoplasms both clinically and microscopically. Neither metastasis nor recurrence has been recorded. In the microscopic studies the material between the vascular channels is a loose acellular connective tissue. Mitosis is never seen. Although the classification "malignant hemangioma of bone" exists in the Registry of Bone Sarcoma, no such case has ever been submitted. We doubt very much whether a malignant hemangioma or malignant transformation of a benign hemangioma ever occurs. True, the literature contains some examples of "angiosarcoma" (Mauguière) but in this case the term "sarcoma" was not used in the sense of a malignant neoplasm.

Treatment. In hemangioma of the vertebrae with symptoms of compression of the spinal cord, laminectomy is indicated. The excellent results obtained in Perman's case and the one presented here would seem to be sufficient evidence in favor of this treatment. Certainly nothing else holds out any hope for recovery from the paraplegia and anesthesia. Roentgen therapy alone should never be used in these cases for the length of time required for obtaining satisfactory results is so long that irreparable damage to the spinal cord would result during the course of treatment. However, of the 5 cases of hemangioma of the vertebrae which have been operated on, 3 have died of shock and hemorrhage and the other 2 almost did so. Therefore the operation of laminectomy in these cases is not to be undertaken lightly, and complete preparation should be made for the treatment of shock and hemorrhage. As to roentgen therapy following operation, we can only say that Perman's case, which was treated with roentgen radiation, is well and in perfect health over three years after the operation, so probably the treatment has prevented further extension of the lesion.

In regard to hemangioma of bone in general, Cases II and III had roentgen therapy only; Case III is apparently cured after several courses of irradiation over a period of four years; Case II showed considerable improvement after only a few months. Three cases, IV, V and VII, were treated by excision; Case VI was treated by curettement and insertion of iodoform wax. Case VIII was treated for a very short time by radium packs followed by curettement. All of these cases have practically recovered from their symptoms.

We interpret these results as indicating that resection or curettement of the tumor whenever possible will give the best and most prompt results. Certainly in a neoplasm which has shown itself to be so benign, radical treatment such as amputation is never indicated. For inaccessible tumors roentgen therapy over a rather long period of time gives satisfactory results.

Radium has never been given a satisfactory trial. Direct implantation of radium or radon seeds into the tumor might be highly effective, but the danger of infection or of bone necrosis must be considered. The successful use of radium in other types of hemangioma suggests its possible value in hemangioma of bone.

CONCLUSIONS

1. Hemangioma of the vertebrae producing symptoms is rare. Symptoms when present are those of compression of the spinal cord. The roentgenologic appearance is typical and easy to recognize.

2. Hemangioma of other parts of the skeleton presents no characteristic clinical signs. The bones of the skull are most frequently involved.

The roentgenologic appearance is of two types:

a. In flat bones (i.e., skull, scapula, pelvis) "sun-burst" trabeculations

of unusual size radiate usually from a common center and mostly from the plane of the bone. The periosteum may be considerably elevated, but is apparently not broken through.

b. In cylindrical bones, the tumor is loculated. These loculations are small with an interspersed fine fibrillary framework. The cortex is usually destroyed but may extend into the center of the expansive tumor. The periosteum, though expanded, remains intact.

3. The microscopic appearance is that of a benign hemangioma, usually cavernous, though one capillary hemangioma is reported here.

4. Amputation is never indicated. Excision of the tumor when possible gives the earliest and best results. Roentgen therapy over a considerable period of time is equally effective and satisfactory. Radium is untried as yet but may prove useful.*

REFERENCES

1. BAILEY, P., and BUCY, P. C. Cavernous hemangioma of the vertebrae. *J. Am. M. Ass.*, 1929, *92*, 1748–1751.
2. BALLANCE, H., and SHATTOCK, S. G. Intramedullary capillary angioma of shaft of humerus, leading to spontaneous fracture. *Brit. J. Surg.*, 1924, *11*, 622–628.
3. BIRCH-HIRSCHFELD, F. V. Lehrbuch der pathologischen Anatomie. Third edition. F. C. W. Vogel, Leipzig, 1887. Cited by Schöne.
4. BRANDT, R. Zur Frage der Angiomatosis retinae. *Arch. f. Ophth.*, 1921, *106*, 127–165.
5. BREGMAN, L. E., and MESZ. Sur un cas d'angiome du crâne et du cerveau. *Rev. neurol.*, 1927, *2*, 191.
6. CODMAN, E. A. Bone Sarcoma. Paul B. Hoeber, New York, 1925, pp. 93.
7. CRUVEILHIER, JEAN. Anatomie pathologique du corps humain. J.-B. Bailliére, Paris, 1835–1842, Livre xxxiii.
8. CRUVEILHIER, JEAN. Traite d'anatomie pathologique générale. J.-B. Bailliere & Fils, Paris, 1856–1862, i, iii and iv.
9. CUSHING, H. Surgical end-results in general, with a case of cavernous haemangioma of the skull in particular. *Surg., Gynec. & Obst.*, 1923, *36*, 303–308.
10. CUSHING, H. The cranial hyperostoses produced by meningeal endotheliomas. *Arch. Neurol. & Psychiat.*, 1922, *8*, 139–154.
11. DEETZ. Angiom der Wirbelsäule. *München. med. Wchnschr.*, 1901, *48*, 1506.
12. DUANE, WM. Roentgen rays of short wavelength and their measurement. AM. J. ROENTGENOL & RAD. THERAPY, 1922, *9*, 167–171.
13. EHRMANN. *Mus. de la fac. de med. de Strasburg.* 1847, No. 3, 1. Cited by Schöne.
13*a*. ERÖS, G. Multiples Hämangiom der Schädelknochen. *Centralbl. f. allg. Path. u. path. Anat.*, 1928, *43*, 532–538.
14. EWING, J. Neoplastic Diseases. W. B. Saunders Co., Philadelphia, 1928, pp. 249.
15. FIBIGER, J. Beretning om de paa Universitetets Patologisk-Anatomiske Institut I tidsrummet 3. september 1910–31. december 1911 udfrte sektioner. pp. 24–25. København 1912-Hospitalstidende No. 40, 1912.
16. FURLKRÖGER, H. Über Angioma cavernosum und Mittellung eines Falles von Angioma cavernosum der rechten Fusssohle und des Calcaneous. *Inaug.-Diss.*, Kiel, 1903. Abst. in *Zentralbl. f. Chir.*, 1904, *31*, 974.
17. GERHARDT, D. Ueber das Verhalten der Reflexe bei Querdurchtrennung des Rückenmarkes. *Deutsche Ztschr. f. Nervenh.*, 1894, *6*, 127–136.
18. GLOBUS, J. H., and DOSHAY, L. J. Venous dilatations and other intraspinal vessel alterations. *Surg., Gynec. & Obst.*, 1929, *48*, 345–366.
19. GOLD, E. Von den wirbelveränderungen im Falle eines Hämangioms an der Dura Spinalis. *Arch. f. klin. Chir.*, 1926, *139*, 729–761.
20. GUILLAIN, G., DECOURT, J., and BERTRAND, I. Compression médullaire par angiome vertébral. *Ann. de méd.*, 1928, *23*, 5–21.
21. HAAS, S. L. Bones. In Practice of Surgery. Edited by D. Lewis, W. F. Prior Co., Hagerstown, Maryland, 1927, ii, pp. 1–132.
22. HERENDEEN, R. E. The roentgen ray in the treatment of giant-cell tunors. AM. J. ROENTGENOL. & RAD. THERAPY, 1924, *12*, 117–125.

* W. Putschar (Über Gefässgeschwülste in der Wirbelsäule. *Ztschr. f. Kreislaufforsch.*, 1929, *21*, 495–500) has recently reported 4 more cases of hemangioma of the vertebrae, all without symptoms. These occurred in the lower dorsal or lumbar vertebrae of individuals thirty, sixty-four and seventy years of age, and were obtained from the systematic examination of 65 vertebral columns. His microscopic findings did not differ from those previously reported, but he concluded that these lesions could be divided into two classes. The first, those in which the lesion is a true neoplasm involving the entire vertebra and often causing compression of the spinal cord; the second, in which the lesion is a simple telangiectasis occurring in an already pathological vertebra. The first type is more common in young individuals, the second, a much smaller lesion, occurs in the aged. We cannot agree with these conclusions and feel that the smaller lesions are merely undeveloped or quiescent forms of the same condition as the more extensive type. Both forms are to be found in both young and old individuals, as our review indicates.

23. Hitzrot, J. M. Hemangioma cavernosum of bone. *Ann. Surg.*, 1917, *65*, 476–482.

24. Kaufmann, E. Lehrbuch der speziellen pathologischen Anatomie für Studierende und Aerzte. Walter de Gruyter & Co., Leipzig, 1922, p. 937.

25. Lücke, A. Ein Fall von Angioma ossificans der Highmorshöhle. *Deutsche Ztschr. f. Chir.*, 1889–1890, *30*, 85–90.

26. Major, R. H., and Black, D. R. A huge hemangioma of the liver associated with hemangioma of the skull and cystic adrenals. *Am. J. M. Sc.*, 1918, *156*, 469–483.

27. Makrycostas, K. Über das Wirbelangiom, -lipom und -osteom. *Virchow's Arch. f. path. Anat. (etc.)*, 1927, *265*, 259–303.

28. Mauguière, L. Angiosarcome de la clavicle. *J. de radiol. et d'électrol.*, 1920, *4*, 269–270.

29. Moltrecht. Osteoaneurysma. *Inaug.-Diss.*, Jena, 1869. Cited by Schöne.

30. Muthmann, A. Über einen seltenen Fall von Gefässgeschwulst der Wirbelsäule. *Virchow's Arch. f. path. Anat. (etc.)*, 1903, *172*, 324–344.

30*a*. Narath, A. Ueber ein pulsirendes angioendotheliom des Fusses. *Verhandl. d. deutsch. Gesellsch. f. Chir.*, 1895, *24*, part 2, 427–432.

31. Nauwerck, G. Ueber einen Fall von Centralem hyperplastischem Capillarangiom (Telangiektasis simplex hyperplastica) des Oberschenkels. *Virchow's Arch. f. path. Anat. (etc.)*, 1888, *111*, 211–218.

32. Pean. Des tumeurs aneurismatiques des os. *Gaz. d. hôp.*, 1896, p. 223. Cited by Schöne.

33. Pentmann, I. Zur Lehre der Splenomegalie. *Frankfurt. Ztschr. f. Path.*, 1915, *18*, 121–151.

34. Perman, E. On haemangiomata in spinal column. *Acta chir. scandinav.*, 1926, *61*, 91–105.

35. Phemister, D. B. Bone tumors; correlation of pathologic and x-ray findings in their diagnosis. *Northwest Med.*, 1929, *28*, 1–8.

35*a*. Pohl, R. Ein Fall von Haemangioma cavernosum der Tibia. *Fortschr. a. d. Geb. d. Röntgenstrahlen*, 1929, *39*, 1099–1100.

35*b*. Renton, J. C., and Teacher, J. H. A central tumour of the tibia; malignant angioma. *Glasgow M. J.*, 1905, *63*, 368–372.

36. Robin. Excision of one-half of hard palate for removal of angioma. *Phila. Med. Times*, 1894. Cited by Schöne.

37. von Rokitansky, C. Lehrbuch der pathologischen Anatomie. Third edition. Bd. II. W. Braumüller, Wien, 1856, p. 130.

38. Ribbert. Kavernom eines Brustwirbelkörpers mit multiplen Kavernomen der Leber. *Deutsche med. Wchnschr.*, 1912, *38*, 390.

39. Saltykow, S. Ueber das Angiom der Wirbelsäule. *Verhandl. d. deutsch. path. Gesellsch.*, 1909, 370–374. Cited by Perman.

40. Schöne, G. Ueber einen Fall von myelogenem Hämangiom des Os Occipitale. *Beitr. z. path. Anat. u. z. allg. Path.*, 1905, *7*, *Suppl.*, 685–701.

41. Schuh. Über die kavernose Blutgeschwulst im Knochen. *Wien. medizinalhalle*, 1862, p. 107. Cited by Schöne.

42. Sicard, J. A., and Forestier, J. Diagnostic et thérapeutique par le lipiodol. Masson, Paris, 1928, pp. 51–131.

42*a*. Sosman, M. C. Radiology as an aid in the diagnosis of skull and intracranial lesious. *Radiology*, 1927, *9*, 396–404.

43. Sosman, M. C., and Putnam, T. J. Roentgenological aspects of brain tumors—meningiomas. Am. J. Roentgenol. & Rad. Therapy, 1925, *13*, 1–10.

44. Stamm, Carl. Beitrag zur Lehre von den Blutgefässgeschwülsten. W. F. Kaestner, Göttingen, 1891. Cited by von Falkowski, A. *Beitr. z. path. Anat. u. z. allg. Path.*, 1913–1914, *57*, 385–414.

45. Stanley, Edward. A Treatise on Diseases of the Bones. Longman, London, 1849. Cited by Schöne.

46. Töpfer, D. Über ein infiltrierend wachsendes Hämangiom der Haut und multiple Kapillarektasien der Haut und inneren Organe; zur Kenntnis der Wirbelangiome. *Frankfurt. Ztschr. f. Path.*, 1928, *36*, 337–345.

46*a*. Torri, O. Angiomi ed encondromi multipli nello stesso individuo. *Clin. chir.*, 1902, No. 2. Abst. in *Centralbl. f. Chir.*, 1902, *29*, 1329–1330.

47. Toynbee, J. An account of two vascular tumours developed in the substance of bone. *Lancet*, 1845, *2*, 676.

48. Toynbee, J. Aneurism by anastomosis, in the substance of the parietal bones. *Lancet*, 1847, *1*, 230.

49. Travers. Removal of the clavicle. *Med. Chir. Trans.*, 1838, *21*, Cited by Schöne.

50. Trommer, B. Zur Lehre der Hämangiome der Wirbelsäule. *Frankfurt. Ztschr. f. Path.*, 1919, *22*, 313–326.

51. Verneuil. Tumeur sanguine siegeant dans l'os scaphoide du tarse. *Bull. Soc. Anat. path.*, 1847. Cited by Schöne.

52. Virchow, R. Die krankhaften Geschwülste. Bd. II. A. Hirschwald, Berlin, 1864–1865.

53. Zajaczkowski, A. Ein Fall von Angioma cavernosum des Stirnbeines. *Przeglad chir.*, Bd. iv, Hft. 3. Abst. in *Centralbl. f. Chir.*, 1901, *28*, 507–508.

54. Ziegler, E. Lehrbuch der allg. path. Anat., Jena, 1901, p. 424.

THE INTRAVENOUS METHOD OF CHOLECYSTOGRAPHY AND LIVER FUNCTION TEST AS EMPLOYED IN OFFICE PRACTICE*

By CHARLES A. WATERS, M.D., *and* JOHN H. KING, M.D.

BALTIMORE, MARYLAND

INTRODUCTION

OUR first object in presenting this report on the intravenous administration of dyes in cholecystography is to point out that this test has been largely relegated to the roentgenologist, who, by reason of the fact that he has not been accustomed to employing intravenous technique, has naturally adopted the simpler method of oral administration of the dye.

Our second object is to show that the intravenous method, as now advocated, is devoid of dangerous reactions, is not time consuming nor complicated, that the resultant cholecystograms are far superior to those obtained by the oral method, and the evidence very much more dependable. Finally, we especially wish to emphasize that the method can easily and safely be carried out in office practice.

It will, perhaps, be of interest, before presenting the results of our study with this method, to give a brief outline of the work which established the present position of cholecystography.

The use of the opaque meal in studying conditions in the gastrointestinal tract brought about such valuable and revolutionary results that it seemed only natural that efforts should be made to study other organs by a similar method. It occurred to the originators of this work, Graham, Cole and Copher,[1] that if an opaque meal could be safely introduced into the gall-bladder its contour might be visualized by the roentgen ray and the resultant cholecystogram would be of aid in diagnosing both normal and pathological gall-bladders. It was appreciated that the substance used must fulfill certain conditions: that it should be excreted into the bile after being injected either intravenously, subcutaneously, or given by mouth, and that it must be as near non-toxic as possible when employed in concentrations sufficient to show the gall-bladder.

The work directed towards determining the functional test for the liver revealed the fact that certain dyes were excreted almost entirely into the bile. Theoretically, any substance containing a metallic bromine or iodine atom would render the gall-bladder visible if it could be introduced there in sufficient concentration. It began to be apparent to workers that there might be a considerable number of possibilities of finding chemical substances which would permit a visualization of the gall-bladder by the roentgen rays. Certain conditions were requisite, namely, that such substances must cast a shadow, have a relatively low toxicity, and not stain the tissues.

RÉSUMÉ OF VARIOUS DYES USED IN CHOLECYSTOGRAPHY

Graham and his co-workers have investigated numerous substances towards this end and it might be of interest, at this point, to briefly summarize their findings. The most satisfactory chemical substances, according to their investigations, are the sodium salts of tetrabromphenolphthalein, tetraiodophenolphthalein and phenoltetraiodophthalein. Gall-bladder shadows were obtained with chemical compounds other than these but there were, for various reasons, serious objections to each of them.

* Read at the Thirtieth Annual Meeting, AMERICAN ROENTGEN RAY SOCIETY, New York City, Sept. 17–20, 1929.

[1] Graham, E. A., Cole, W. H., Copher, G. H., and Moore, Sherwood. Diseases of the Gall Bladder and Bile Ducts. Lea and Febiger, Philadelphia, 1928.

In their early work, they first employed the sodium salt of tetraiodophenolphthalein but, on account of the impurities in the original sample of this salt, which caused an inconsistency in the toxicity, they began the use of tetrabromphenolphthalein. However, because of the higher atomic weight of the iodine compound and its greater impermeability to the roentgen rays, a more refined product of the tetraiodophenolphthalein was tried and found to have about the same toxicity as the bromine compounds. Furthermore, tetraiodophenolphthalein was superior in that it required a smaller dose to produce equally good cholecystograms. The salts of thirteen substances were found to produce cholecystograms. All of these, except four, had disadvantages which prevented their clinical use. Two—tetraiodophenolphthalein and its isomer, phenoltetraiodophthalein—were found to be far superior to any of the others. The isomeric salt has the advantage of staining the blood serum, thereby determining hepatic function simultaneously with cholecystography. It is rapidly excreted by the liver and a smaller dose is required.

METHOD OF LIVER FUNCTION TEST

Briefly, this is determined by withdrawing 12 c.c. of blood one-half hour after all the dye has been injected. The blood is allowed to clot and the serum to separate by gravity in an ice box over night. The percentage of dye in the serum is determined colorimetrically by comparison with a set of standard tubes (Fig. 1). A retention of less than 12 per cent of the dye in the blood serum one-half hour after the injection and less than 4 per cent one hour after the injection is considered normal. The greatest retentions, according to Graham and his coworkers, have been found in patients with acute cholangitis and hepatitis, such as that encountered in acute catarrhal jaundice and some cases of severe, acute cholecystitis. The amount of retention may be as high as 80 to 90 per cent.

METHODS OF ADMINISTRATION OF THE DYE

The early method of administering the dye was exclusively by the intravenous route but various other methods were tried such as subcutaneous injection, administration per rectum, intraduodenally, and

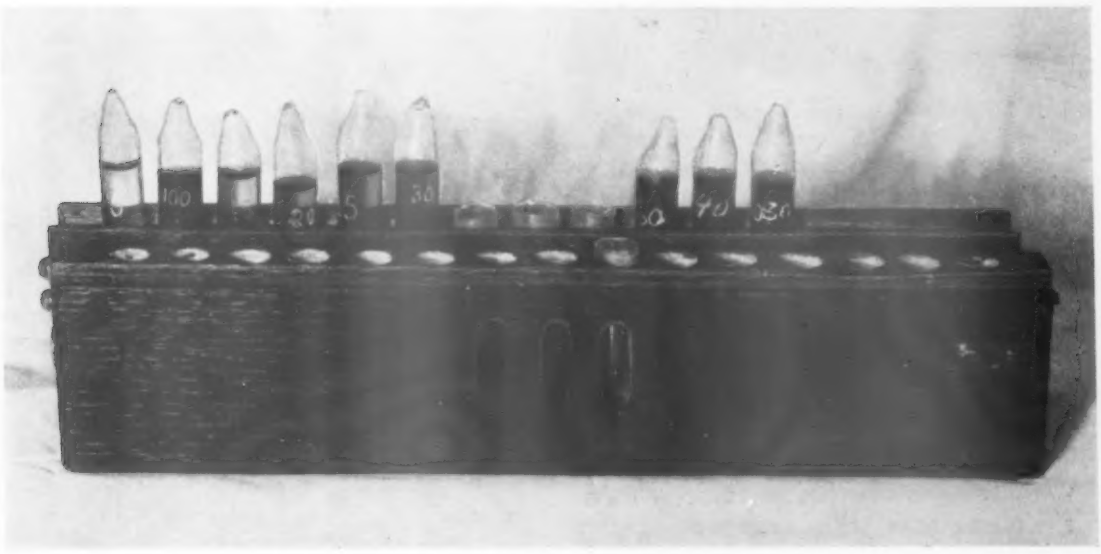


Fig. 1. Colorimeter for liver function test. Tubes standardized in percentages of Iso-Iodeikon

by mouth. All of these have been abandoned except the intravenous and oral methods, because the resultant cholecystograms were faint and inconsistent.

At the present time there is much controversy regarding the comparative value of the intravenous and oral methods. Proponents of the oral method contend that satisfactory cholecystograms can usually be obtained and fewer disagreeable effects encountered, notwithstanding the fact that by this method it is often necessary to repeat the test several times. Advocates of the intravenous method claim that it insures the introduction of a definite quantity

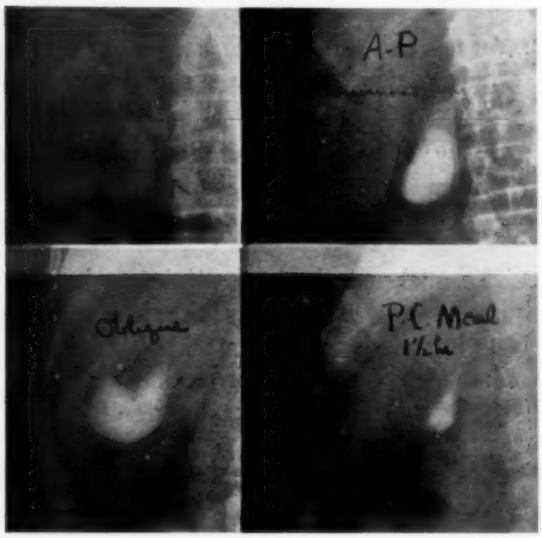


FIG. 2. Four views taken of the same patient. The upper left hand film was taken after the oral administration of the dye, the others after the intravenous injection. Note how the oblique view clears up the cause of the increased density in the fundus seen in the anteroposterior view.

of the dye into the circulation, which is known to be sufficient to produce satisfactory cholecystograms, and that if proper care is exercised in the injection few disagreeable symptoms will be encountered (Figs. 2, 3 and 4).

With the use of the less toxic isomeric salt (phenoltetraiodophthalein) intravenously, the results obtained are so far superior to those of the oral method that

FIG. 3. This shows another case in which the gall-bladder was not visualized by the oral method but was completely filled by the intravenous method.

it is difficult to understand why the oral method should be used, except in cases where the intravenous method is contra-indicated.

The authors have recently seen 3 cases illustrating this point:

CASE I. A young woman, aged thirty, was given sufficient dye by the oral method to outline the gall-bladder, but not enough to reveal 32 small negative shadows brought out by the intravenous injection (Fig. 5).

CASE II. A man, aged fifty, had the oral test three times, always with non-visualization. The intravenous method showed a marked concentration and a normal gall-bladder (Fig. 6).

CASE III. A man, aged forty-five, had the oral test five times with non-visualization. The intravenous method revealed a perfectly visualized gall-bladder which was normal.

The method we have employed is simple, devoid of unpleasant reactions, and

FIG. 4. This shows the comparative degrees of concentration of dye in the two methods. Note the shadow of lessened density (stone) seen in the intravenous film which could not possibly be shown in the films made by the oral method.

Fig. 5. Shows films made following each method of administration. By the oral method there is practically no visualization, yet after the intravenous method there is perfect visualization showing more than thirty negative stone shadows.

the results so gratifying, that we firmly believe that the proponents of the oral method will sooner or later adopt the intravenous administration of the dye as a routine procedure in cholecystography.

THE AUTHORS' METHOD

1. *Dye.* In our series, sodium phenoltetraiodophthalein (Iso-Iodeikon, Mallinckrodt) has been used exclusively. Regardless of body weight, 2.5 grams is given each patient. The dye is dissolved in 40 c.c. of freshly distilled water, filtered through fine filter paper, and sterilized for twenty minutes in a boiling water bath. Solutions should be freshly made, preferably not more than two hours before they are used. As a rule, if made up in dilute solution, there is less tendency to reaction or venous thrombosis. The dye should be introduced by gravity.

2. *Method of Administration.* The site of injection, usually the median basilic vein, is cleansed with iodine and alcohol. After the introduction of the needle (No. 19), about 50 c.c. of salt solution is allowed to flow into the vein. This is followed by the slow introduction of the dye, alternating each 10 c.c. of dye with twice the amount of salt solution (Fig. 7). After all the dye has been introduced, the vein is thoroughly washed out with more salt solution to prevent leakage of the dye into the tissues, thereby avoiding any danger of necrosis.

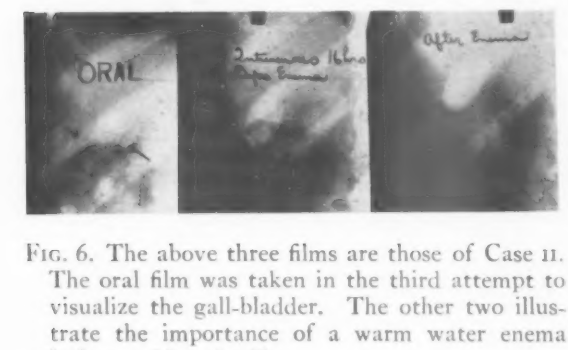


Fig. 6. The above three films are those of Case 11. The oral film was taken in the third attempt to visualize the gall-bladder. The other two illustrate the importance of a warm water enema before making the films.

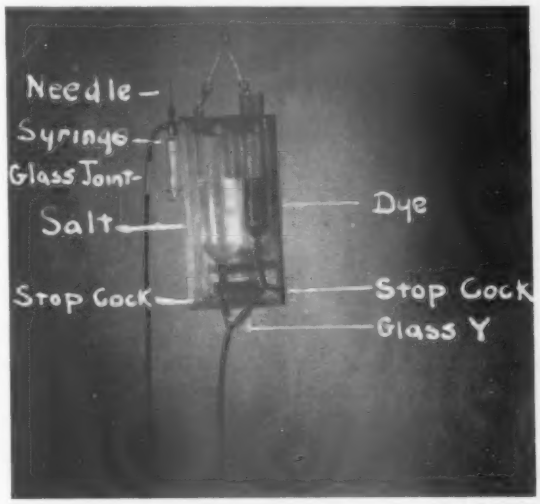


Fig. 7. Arrangement of the dye and salt solution. Note clip for holding syringe and needle out of the way when not in use.

The entire injection consumes about fifteen minutes. Care should be employed in having both the dye and the salt solution at body temperature. It is our opinion that the slow introduction of the dye in combination with physiological salt solution has a great deal to do with preventing disagreeable reactions. We have insisted that our patients lie down for half an hour after the injection. The injection may be given in the morning, afternoon or night. It is not necessary for the patient to go into the hospital or remain at home for the injec-

FIG. 8. Normal gall-bladder showing the clear cut lateral view.

tion. Almost all of our cases have been injected at the office, a few in the morning, a few at night, but the majority in the afternoon. A few hours before the injection the patient is allowed to eat a hearty meal

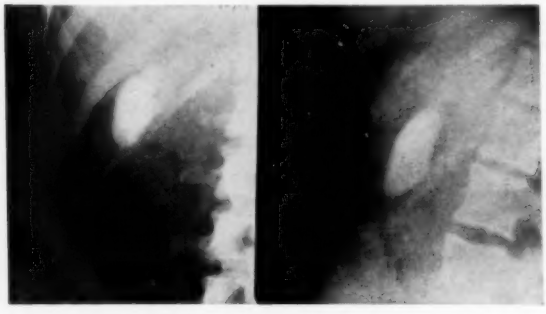


FIG. 9. These two views demonstrate very clearly what can be expected in normal cases. Note the sharp, clear cut outlines in the lateral view.

free of fats. After the injection, no food of any kind must be taken, except plain tea, coffee or water. In our experience, the most satisfactory cholecystograms have been obtained when the injections were given in the afternoon and the films made the following morning. It is for this reason that we have elected to give the dye in the afternoon.

After satisfactory films have been obtained, the patient is allowed a fatty meal, and is re-examined about two hours later (Fig. 8). This has usually been sufficient to determine the degree of contraction and emptying of the gall-bladder. The roentgenograms, in our experience, must be taken with the shortest possible exposure, employing the Bucky diaphragm. A sufficient number of films must be made and at different angles to insure a clear and unobstructed view of the entire gall-bladder so that no confusion will be encountered by the overlapping loops of gas-containing

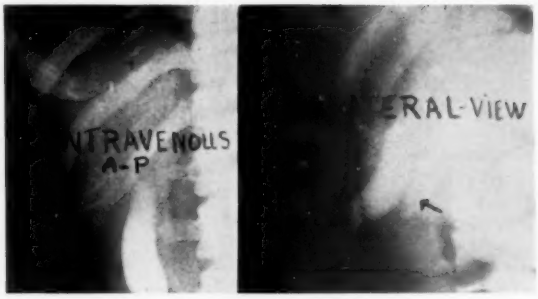


FIG. 10. Normal concentration of dye by the intravenous method. Anteroposterior and lateral views are made as a routine procedure.

FIG. 11. Three views of gall-bladder showing stone in fundus as indicated by arrow. Only by employing the intravenous method has it been possible to obtain oblique and lateral views.

intestines. With the intravenous method, sufficient concentration of dye is obtained to allow the taking of lateral and oblique views (Figs. 9, 10 and 11). This is impossible when employing the oral method. Furthermore, we have routinely given a warm water enema just before taking the films in order to thoroughly rid the colon of gas (Fig. 12). This is a real aid in obtaining clear cut cholecystograms, as shown in Figures 6 and 12.

EFFECTS OF THE DYE

In the early period of cholecystography, before the use of phenoltetraiodophthalein, reactions were frequent, and occasionally of an alarming nature. It has been our experience, in 96 cases using the intravenous administration of the above-mentioned dye, that serious discomfort to the patient has never been encountered, and it

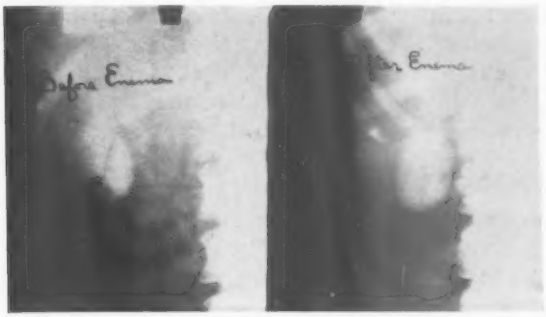


FIG. 12. Showing visualized gall-bladder before and after a warm water enema.

is seldom that disagreeable reactions occur at all.

With the oral method, the reactions have consisted of nausea, vomiting, diarrhea, abdominal cramps and headache, while with the intravenous method the disagreeable reactions have been headache, chilly sensations, erythema, urticaria, and one case of venous thrombosis.

RESULTS

Operated Cases. In a series of 96 cases, up to the present time, 11 have been operated on. The operative findings confirmed the cholecystographic diagnosis with respect to the presence of gall-bladder disease and cystic duct obstruction in 10 of the 11 cases, or in 91 per cent. The remaining case showed a normal-sized gall-bladder, but very faint visualization which was roentgenologically considered pathological. At operation only adhesions around the cystic duct were found. The gall-bladder was removed but microscopically no disease could be found.

Unoperated Cases. In a series of 57 cases the cholecystographic diagnosis agreed with the clinical impressions in 56 cases, or in 98 per cent. The one case was examined to determine whether a shadow was a renal calculus or gallstone. Cholecystogram showed a non-visualization of the gall-bladder. The stone proved to be renal and was removed but the gall-bladder was not explored.

Liver Function. The liver function test was carried out in 39 cases. The highest retention was 40 per cent, in a case of cholecystitis and cholelithiasis in an emaciated woman of sixty years. Operation was not advised. The lowest was 5 per cent, in two cases, one in a normal gall-bladder, the other in a case of cholecystitis. The liver function test was above normal in 19 cases 48.7 per cent. In this group the liver function was above normal in 7 cases without demonstrable gall-bladder disease. It was above normal in 10 cases with hepatobiliary tract disease, and it was normal in 11 cases with hepatobiliary tract disease.

It can easily be seen that the liver function test may be normal in face of gall-bladder disease, but there was a slight tendency in our series for the test to run a little higher in those cases with hepatobiliary tract disease. In our series of 11 cases which were operated upon, the highest retention was 22 per cent. All of these cases made good recoveries.

Doing the liver function test gives additional information as to whether or not the liver is functioning within normal limits and also a warning to the surgeon when very high retentions are found. Graham, Cole and Copher, in their studies on liver function in hepatobiliary tract disease, point out that one of the most important results has been the ability to predict the operative risk and time for operation. In their experience cases with very high retention are poor operative risks.

CONTRAINDICATIONS

According to Graham, cardiac decompensation and threatened uremia are the only two conditions which definitely contraindicate the employment of the intravenous method. It has been observed that patients with abnormally high or low blood pressure are more susceptible to reactions than those whose blood pressure is within normal limits. In our series, the lowest blood pressure was 90 and the highest 220. Neither of these cases had any change in

pulse or blood pressure after the injection of the dye.

The dye has been given to cases with severe jaundice due to cholangitis, common duct obstruction, and severe liver damage from arsphenamine poisoning, without producing any reactions whatsoever. In our experience, mild reactions, chiefly erythema and urticaria were encountered in neurotic and postoperative thyroid cases.

Examination of urinary specimens the morning after injection of the dye has shown no evidence of kidney damage, i.e., no albumin, casts or red blood cells, but the dye can be demonstrated colorimetrically in the urine obtained the morning following the injection, showing that although some of the dye is eliminated through the kidneys, no damage is done.

CONCLUSIONS

It is our experience with the intravenous injection of phenoltetraiodophthalein that the dye is comparatively non-toxic since few disagreeable reactions have been encountered and none of these were of an alarming nature. The method of injecting the dye is not technically difficult nor unusually time consuming, three injections being easily given in one hour. The cholecystograms are far superior to those obtained following the oral administration and the information gained from the films is more conclusive, because the intravenous administration insures the introduction of a definite amount of dye and is not complicated by factors of solution and absorption in the gastrointestinal tract. In addition, the liver function can be simultaneously determined.

DISCUSSION

DR. JAMES T. CASE, Chicago. I wish to compliment Dr. Waters on his presentation. It does not make me feel badly to have him support the intravenous method, but I have ceased to worry about whether my colleagues use the intravenous or the oral method. I want everybody to be happy. I ask the same privilege for myself and for that reason I practically always use the intravenous method; but in order to let the other fellow be happy, I am quite willing, when he insists on the oral method, to use it for him. That gives me a good chance to demonstrate why it isn't the best way.

I have now had about 4500 cases of intravenous injection of the dye for cholecystography. The technique which we have followed is identical with that of Dr. Waters except that we have not of late, in fact not in the last three thousand cases, made any difference in the rate of the introduction of the dye. In fact, we try to get it in as quickly as possible, and we can do 8 or 9 (I have even done 10) in one hour, without any greater incidence of unpleasant reactions than when I did 3 or 4 in an hour.

After the injection it has been our custom to allow the patient to take a rather hearty meal, provided he restricts himself to carbohydrates. The carbohydrate meal, because the average individual does not understand what that means, is specified. They may have fruits of any kind except olives; they may have bread with fruit jam, but not with butter; they may have rice, provided only sugar is put on it and not milk nor butter; they may have baked or boiled potatoes, provided no butter is used. We prefer that they take very little or no protein and no fats whatsoever. That must be stressed a great deal. The use of mineral oil at night apparently does not interfere with the Graham test. So that is a little better than allowing the more restricted meal that Dr. Waters suggested. I do not believe it will interfere; in fact, I have proved it does not interfere with the filling of the gall-bladder.

We have usually made the introduction of the dye in the late afternoon, that is, after 4 o'clock. The one complication which has really been distressing following the intravenous method is the production of sore arms. I think we have hit upon a scheme for minimizing the incidence of sore arms, which formerly occurred in about 1 per cent of the cases; the patients had an aseptic thrombosis. In my very first case of sore arm I learned that the soreness was produced by carbolic acid which the nurse had left in the needle. There was a definite slough. I thought that was a real danger, but I have never seen it since, and I feel confident that it was due to a small bit of carbolic acid left in the needle. Since we have taken the precaution to wash out the carbolic acid, and

especially to infiltrate the perivascular tissues with 8–10 c.c. of normal salt solution whenever we even suspect we may have put some of the dye outside of a vein, we have not had very many sore arms. We had one series of 1106 injections without a single case of sore arm.

After introducing the needle, we never inject the dye until the Ringer's or salt solution is flowing freely. There is a definite rapid rate of drop of the level of the Ringer's solution in the burette. We see no puffing of the tissue in the arm. If there is, we simply do not give the dye in that vein; we take another vein. If, however, after we are through we are a little dubious about whether we have given the injections squarely and fairly into the vein and are fearful that there has been a slight infiltration of the tissues around the vein, I simply have at hand another syringe with a very fine needle and with that we deliberately infiltrate the tissues around the vein with at least 10 c.c. of Ringer's solution. That puffs up the arm quite considerably and appears to dilute the small amount of dye which may have escaped, so satisfactorily that the patient has no bad after-effect.

I also in those cases ask the patients (or the nurse, if they are institutional cases) to see that hot applications are made over the bend of the elbow immediately after the injection; in fact while the patient is lying down for the twenty minutes or the half hour before we allow them to go to their homes, I have one of my own attendants put some hot towels on the arm. It has a good effect, I am sure.

I am glad Dr. Waters brought out the importance of the estimation of the liver function test and the possibility of doing it simultaneously. It, to me, is a very important reason for using the intravenous method rather than the oral.

As to contraindications, I quite agree with Dr. Waters and I do not like to give the test to any patient who is likely to be upset by a profound alteration of blood pressure, because in a fair percentage of cases there is an immediate hyperemia of all the superficial tissues following this injection. True, it is transient and of no consequence in the average case, especially if you warn the patient it will come; but in a patient with marked myocardial degeneration, I think it is possible to cause a considerable upset, so I would rather not use it there. However, in the course of a month's work there is only a case or two that we exclude for that reason.

I do not use the test in jaundice, not because jaundice is a contraindication, but because the test is usually useless in that condition, for we almost invariably fail to visualize the gall-bladder.

Dr. Sherwood Moore, St. Louis. I am always happy when I learn of other men who employ the intravenous method of cholecystography. We have followed that method from the first, and with the exception of Dr. Case, we have generally not had much support for our views in regard to this method. Unquestionably, in our hands the intravenous is invariably superior and more reliable than the oral method of cholecystography.

I was interested to hear Dr. Case say that they are speeding up their rate of intravenous injection. We are doing the opposite, and our method of giving the intravenous dye is almost exactly that of Dr. Waters.

I am glad that he is emphasizing the value of the combination of cholecystography and the liver function test. Undoubtedly that procedure determines the question of operability far better than anything we have for making such an estimate.

Re-emphasis of the type of case to which the dye should not be given intravenously is not out of place. It is a very serious matter to give the dye intravenously to cases with heart disease. With that exception, we have not yet found any other contraindications to cholecystography.

In this connection I would state that our experience tallies with Dr. Case's experience with patients who have jaundice. It is a perfectly safe procedure, but it is useless. We have never visualized a gall-bladder in such a patient.

Dr. W. F. Manges, Philadelphia. I would like to ask Dr. Waters if he has made any intravenous studies with half the amount of dye that he has been using. Judging from his slides, I can conceive that there are gallstones that would be missed because of the extreme density of the gall-bladder shadow. After all, we do not need as dense a shadow as that, and I feel that is one argument perhaps in favor of the oral method. I am wondering whether it wouldn't be still safer and entirely reasonable to use half or even a quarter of the amount of the dye that he has been using.

DR. A. W. CRANE, Kalamazoo, Mich. It is certainly often a matter of convenience to use the oral method. After hearing Dr. Stewart talk on this subject some years ago we began using the same preparation that is used intravenously in plain capsules after an evening meal. There is no question that in the majority of normal gall-bladders a perfectly satisfactory outline of the gall-bladder is obtained by the oral method, and the gall-bladder will show just as dense a shadow as after the intravenous method. The dye can be given orally with such convenience that in a great many gastrointestinal cases it can be used as a routine where the surgeon or the physician has not especially requested an examination of the gall-bladder. Even though there is some barium in the colon it does not materially interfere with the validity of the test. In those cases where a normal gall-bladder is not demonstrated by the oral method, the intravenous method probably should be used rather than a repetition of the oral method. That reduces the use of the intravenous method to a comparatively small proportion of cases.

DR. R. R. NEWELL, San Francisco, Calif. We have been using the oral method more than the intravenous because of the incidence of sore arm, and I would like to hear from Dr. Waters if the new isomer produces fewer sore arms, a lower incidence of thrombosis, than the old isomer.

By mouth with 4 grams, we ordinarily get a concentration of about 1 per cent in the bile in the gall-bladder, though occasional cases will run as high as 3 per cent, yet by vein with 2 grams we ordinarily get from 2 to 3 per cent in the gall-bladder in cases not pathological.

I would like to bring up the question of seeing that the gall-bladder is empty at the beginning of the test. It has seemed to us worth while to give a glass of milk and cream three or four hours before the test rather than have the patient come with the gall-bladder in whatever condition it happens to be, full or empty.

DR. W. H. STEWART, New York City. I would like to say that my opinion has not changed at all. I use the oral method; I have used it in something like 5000 cases, and I have in no instance felt disappointed in that procedure.

I will concede this, that if you do a liver test in combination with cholecystography the intravenous method must be used. The oral method, however, should not be condemned from inexperience and lack of proper technique. Dr. Waters' statements lead one to believe that complications occur only with the oral method. It might be interesting to find out how many sore arms occur after the intravenous injection of the dye. If a canvass were made I believe it would be found that a great majority of roentgenologists are using the oral method.

I must agree with Dr. Case and Dr. Moore that in jaundice the test is absolutely useless.

DR. WATERS (closing). I feel that I should apologize to the Society for presenting a subject with such a small number of cases when there are so many of my colleagues here who have had so much more experience. I asked Dr. Imboden for the privilege of presenting my work because I wanted to emphasize the fact that, as roentgenologists, we can easily learn to do intravenous injections ourselves. In my series, I have done all of the injections myself. Furthermore, the procedure can be carried out in office practice just as simply as any other roentgenological examination.

An important part of this method is the employment of the new isomeric salt, Iso-Iodeikon. Just recently Mallinckrodt has reduced the cost from twenty-one dollars for five doses to eleven dollars, so now the price is not prohibitive.

Answering Dr. Stewart's question. If you will follow the technique as advocated in that fine book by Graham, Cole, Copher and Moore, I believe most of you will replace the oral method of cholecystography by the intravenous method and, I am sure, your results will coincide identically with theirs and mine.

We have given the dye in patients with jaundice simply to compare our results with those of the other men doing this work.

In regard to Dr. Manges' question about using half the amount of dye, we haven't done that because we thought it was necessary to establish firmly, in our own minds, just what 2.5 grams would do. I think it is quite possible that a small amount of dye will act just as well and give just as good visualization and it may show some negative shadows which have been missed with the larger dose.

I would like to say a word about Dr. Crane's remarks. We became so thoroughly dissatisfied

with the results of the oral method in normal, as well as pathological cases, that it prompted us to start the intravenous method. I feel almost certain that, in our series at least, almost 50 per cent of normal gall-bladders failed to visualize with the oral method.

Dr. Stewart. May I ask a question? That is rather a broad statement. Would you tell us your technique in the oral method?

Dr. Waters. It has been so long ago now that I have almost forgotten how we did it. We used all the different dyes on the market, both in capsules and liquid form. We gave it at night before going to bed and made the films the next morning, and there certainly were a very great number of those cases that didn't have any dye in the gall-bladder the next morning.

I would like to say just a word in regard to Dr. Newell's remarks about sore arms. We have a new intern in one of the hospitals in Baltimore who just came off his service. The day before I left he was telling me about the more or less unfavorable attitude there toward the intravenous method, because of the great frequency of venous thrombosis and sore arms. We have had one sore arm, just about ten days ago, the first one in 96 cases. This was a thrombosis of a collateral vein 4 to 5 inches from the site of injection. It wasn't due, I am sure, to leakage of dye. We don't know just why it did occur, and it is one of those things that occur like thrombosis from typhoid fever or other infectious diseases.

I greatly appreciate the opportunity to present such a small series of cases for your consideration and I certainly hope that a large majority of you will go home and adopt the intravenous method of cholecystography, because I am sure you will be more satisfied with the results.

PREVENTION OF REACTIONS FOLLOWING ORAL ADMINISTRATION OF SODIUM TETRAIODO-PHENOLPHTHALEIN

By JOHN H. FITZGIBBON, M. D.
PORTLAND, OREGON

ALTHOUGH reactions following oral administration of sodium tetraiodophenolphthalein are now less frequent and severe than in the earlier years of cholecystography by this method, an occasional patient will experience rather unpleasant gastrointestinal symptoms following administration of the dye. Most disturbing are diarrhea, abdominal cramps, nausea and at times vomiting. The intravenous method is not ordinarily accompanied by gastrointestinal reactions. For this reason, in addition to greater certainty of gall-bladder filling, the intravenous method has increased in popularity, particularly in institutions. For office use, however, the greater convenience of the oral method renders it desirable, provided minor difficulties can be overcome.

Oral administration of the dye in grape juice, according to the method of Levyn and Aaron,[1] has decreased the frequency and severity of reactions, and at the same time has been followed by more satisfactory filling of the gall-bladder than by the pill or capsule method. There have, however, been gastrointestinal reactions, especially in patients with colitis. It seems likely that in addition to the irritating effect of the dye, the laxative action of the grape juice, in which the dye is suspended, has contributed somewhat to these upsets.

In order to decrease the irritating effect of the dye suspension upon the gastrointestinal tract, the amount of grape juice should not exceed 6 ounces, and in patients known to have an irritable bowel, it has been our custom to give a small dose of opium about one-half to one hour before the dye is taken. This method has been most efficient in preventing diarrhea, cramps, and nausea. The sedative action of the opium has generally induced a sound sleep free from the usual annoyance of gastrointestinal discomfort and loose stools.

Gall-bladder visualization has been satisfactory and possibly improved by increased absorption of the dye owing to decreased intestinal motility. No attempt has been made to standardize the dose of opium but it has been adapted to the apparent needs of the individual patient. One or 2 drams of paregoric, or 10 to 20 minims of the tincture has been the usual dose. Capsules or tablets of powdered opium may be used with greater convenience than the liquid preparations if desired.

[1] Levyn, Lester, and Aaron, A. H. Cholecystography by the oral administration of sodium tetraiodophenolphthalein in solution. AM. J. ROENTGENOL. & RAD. THERAPY, 1927, *18*, 557–559.

SUMMARY

Gastrointestinal reactions following the oral administration of sodium tetraiodophenolphthalein have been most commonly observed in patients suffering from colitis.

Diarrhea, cramps and nausea may be prevented by a small dose of opium one-half to one hour before the dye is ingested.

Increased absorption of the dye and improved visualization of the gall-bladder may result from decreased peristaltic activity.

Vol. XXIII, No. 1

ROENTGEN IRRADIATION IN UNRESOLVED PNEUMONIA

By EDWIN A. MERRITT, M.D., *and* EDGAR M. McPEAK, M.D.
WASHINGTON, D. C.

IT HAS been recognized for some time that irradiation of infected tissues, such as furunculosis, cellulitis, etc., markedly accelerates the natural process of resolution. This is accomplished, as in nature, by one of two methods: either by regression and disappearance or by suppuration followed by resolution. The exact *modus operandi* is not understood, as in many other effects of irradiation, though it is generally believed to be a local change in the chemistry of the tissues.

Familiar with these facts, it occurred to us that irradiation might be beneficial in cases of delayed resolution following lobar pneumonia. We therefore tried it on our first case, not knowing at the time that its successful use had been previously reported as early as 1907 by Edsall and Pemberton.*

Its success in this case led to its use in 6 additional cases which later came under our observation.

CASE I. J. B. G., male, white, aged thirty-five, a local internist who had had a lobar pneumonia approximately six weeks previously. He had failed to regain his former strength and was running a slightly elevated temperature with all of the other clinical evidences of an unresolved process. An area of infiltration was noted in the right base during the routine roentgenoscopic examination, and it was decided to irradiate the chest from all angles while he was being examined. This was done by means of the roentgenoscope. The exact dosage of this treatment was not known, but was approximately three-quarters of a skin unit dose.

The subsequent history was briefly as follows: The following day he coughed up approximately 3 ounces of a purulent material, after which there was a rapid drop in the temperature to normal and a return to his normal strength. Examination several days after the treatment showed the lung fields clear.

The result in this case was so satisfactory that we decided to standardize our dosage and have in all other cases used the following technique: 5 ma., 7 inch spark gap, 4 minutes' time, 10 inch target-skin distance, with 3 mm. aluminum filter. One area anterior and one area posterior of the affected side is the usual routine. This may be safely repeated after ten days.

CASE II. K. L. B., male, white, aged forty-six. He had had a lobar pneumonia four weeks previously but had continued to run a temperature between 99° and 100.5°F., with a hacking cough, general malaise and aching pains throughout his chest and back. The white blood cell count was 13,500. Examination of the chest showed a zone of infiltration approximately 4 cm. in width extending from the right hilus to the periphery in the region of the third and fourth interspaces anteriorly. This unquestionably represented an unresolved pneumonic area and a treatment was given.

His temperature went to 101°F. that evening but his condition was otherwise unchanged. He likewise coughed up considerable purulent material the next day with a subsequent drop to normal in the temperature within twelve hours, which remained normal throughout the period of observation. Roentgenograms taken two days after the treatment showed the parenchyma definitely clearer with no change in the amount of infiltration at the hilus. The leucocyte count at this time was 7,100, a drop of 6,400. The chest was re-examined after four more days, showing the parenchyma practically clear with little change at the hilus. The patient was clinically well and left the hospital refusing further treatment. This case, though not completely recovered was definitely improved. One more treatment would have been advisable.

* Edsall, D. L., and Pemberton, R. The use of the x-rays in unresolved pneumonia. *Am. J. M. Sc.*, 1907, *133*, 286-297.

CASE III. P. P., male, white, aged thirty-five, who had had a bilateral lobar pneumonia a little over a month before with persistent bilateral consolidation. This was the sickest patient to recover that we have ever seen. Examination of the chest showed a rather diffuse consolidation of the lower two-thirds of the left side and encapsulated fluid in the upper half of the right side. Treatment was given and five days later an examination showed the consolidation practically entirely gone with a complete disappearance after a few more days. The encapsulated fluid was dealt with surgically with complete recovery (Figs. 1, 2, and 3).

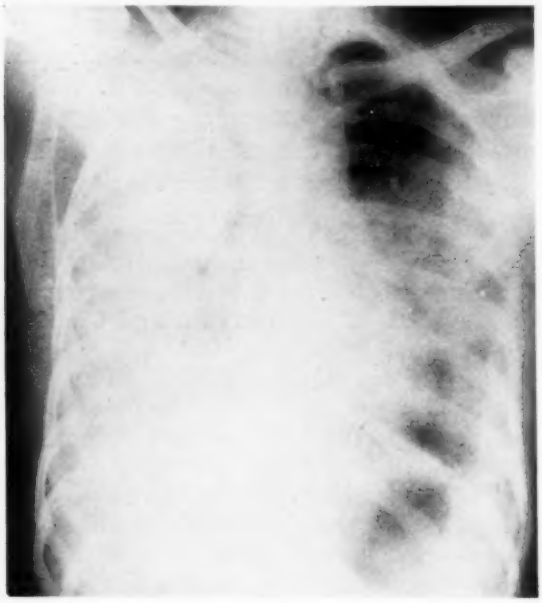


FIG. 1. Case III. Showing condition before roentgen treatment.

CASE IV. A colored woman, aged thirty, who gave a history of an acute respiratory infection several weeks before. Examination showed a definite increase in the size of the right hilus shadow. This was thought to be inflammatory in nature and treatment was given. Examination several days later showed a definite decrease in the size though not a complete disappearance of the pathological process. This patient came to us through the dispensary service and was advised to return for another treatment, but never came back. More therapy would have been advisable.

CASE V. A white woman, aged thirty, who contracted pneumonia three months before. The symptoms had persisted and when we

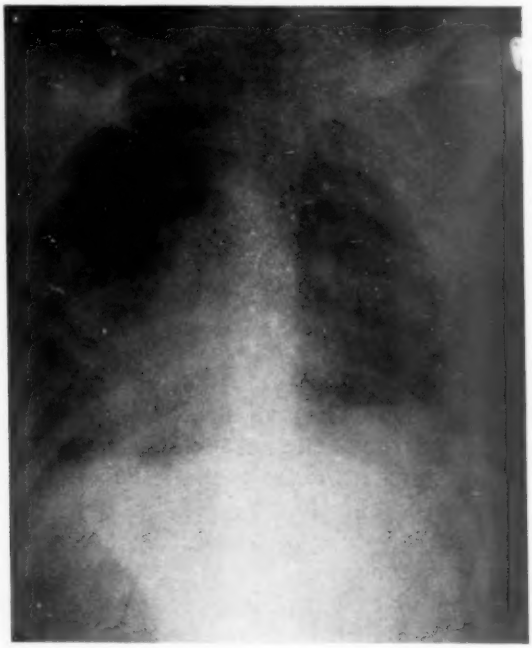


FIG. 2. Case III. One week after roentgen treatment

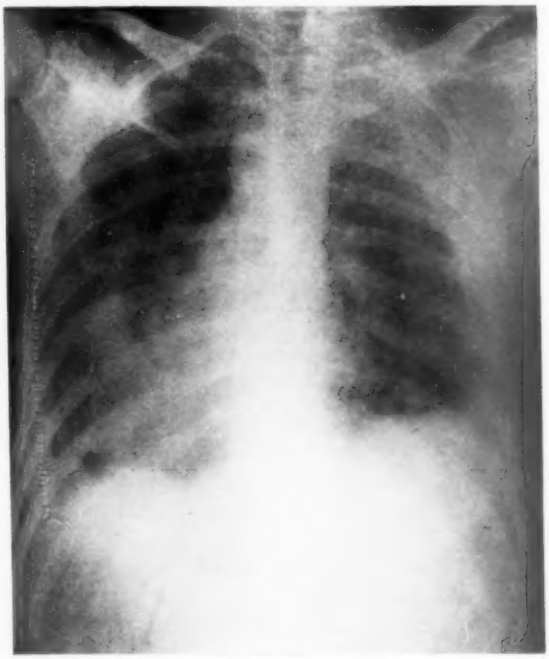


FIG. 3. Case III. Three weeks after roentgen treatment.

saw this patient her general condition was very poor. She had been confined to her bed all of the time and was brought to us on a stretcher for an examination of the chest. The roentgenogram showed a rather marked consolidation of the left upper chest with cavitation. A treatment was given over this region and the following day she coughed up a quantity of foul, purulent material. Her condition showed a marked improvement from then on and recovery was uneventful. Examination a short while subsequent to the treatment showed a marked improvement, and another examination ten days later showed no evidence of infiltration (Figs. 4 and 5).

Fig. 4. Case v. Showing condition at the first examination, before roentgen treatment.

Case vi. A white woman, aged twenty-nine, who had the primary lesion several weeks before. Examination of the chest showed considerable infiltration in the region of the fourth and fifth interspaces, anterior, right. A treatment was given and an examination approximately ten days afterward showed the lungs clear.

Case vii. Male, white, aged seventy-five, who had never had a definite history of a previous pneumonia but who had been in poor health for a little over a year. He had lost considerable weight, was running a temperature varying from normal to a little over 100°F., and was extremely weak. The clinical diagnosis was probable pulmonary tuberculosis. Examination showed an extensive infiltration in the right upper chest which appeared to be non-tuberculous. Three treatments were given at intervals of ten days but no change whatever was noted either in his clinical history or in the roentgen findings. Further treatment was thought inadvisable since improvement should have taken place in that length of time.

Fig. 5. Case v. Five weeks after roentgen treatment.

In the 7 cases here reported, 4 cleared up entirely, 2 definitely improved, and one was unchanged. These cases are far too few to draw any final conclusions, though several points seem to warrant special attention.

The 4 cases responding to one treatment were those in which the process involved the parenchyma only. It would therefore

seem that resolution is brought about more quickly in this type of case.

In the 2 cases showing improvement the process involved the glands at the hilus. One of these, Case II, also had an area of infiltration in the parenchyma which responded rapidly. It would appear that lesions at the hilus are a little more sluggish in their response and require more therapy than those involving the parenchyma alone.

The case in the series showing no improvement (Case VII) was a man seventy-five years of age who had been sick for over a year. He was sent to us with a provisional diagnosis of pulmonary tuberculosis. His general physical condition was very poor which may, in part, explain his failure to improve, and, too, there is a question as to the exact nature of the lesion.

The results in these few cases have been prompt and gratifying with no untoward effects. The treatment is of brief duration, entailing no strain nor discomfort to the patient, and appears to be a distinct addition to the meagre and unsatisfactory methods in common use.

We offer the suggestion that irradiation should be instituted in all cases showing definite roentgen signs of delayed resolution three weeks after the onset.

A COMPARISON OF RADIUM AND RADON NEEDLES AND PERMANENT RADON IMPLANTS*

By EDITH H. QUIMBY, M. A.
Department of Biophysics, Memorial Hospital
NEW YORK CITY

THE value of interstitial irradiation in cancer therapy is constantly becoming more widely recognized. Methods for determining doses delivered by buried sources are being developed, and it is hoped that in the near future the whole dosage problem in radiation therapy will be put on a sounder basis than the empiric one in use at present.

Before this can be done, a complete correlation between the different types of implants used in practice will have to be developed. In this country practically all of the filtered permanent radon implants in use have a filter of 0.3 mm. of gold, and a length of 4 to 5 mm. The removable ones have a filter of 0.25 to 0.3 mm. of platinum and are 5 to 6 mm. long. The strengths of either of these may range from a fraction of a millicurie to 4 to 5 mc.—seldom more. Small differences in filtration of these may be easily allowed for (or neglected for a first approximation), and the only difference to be considered† is that of the duration of the irradiation for different initial strengths. The radium needles, which are also extensively used for interstitial irradiation, may have filters of steel, monel metal, or platinum, of various thicknesses, and may range from 1 to 4 cm. in length, the radium salt being distributed more or less evenly throughout the shaft. They may range in strength from 1 to 12.5 milligrams, or even higher. Obviously the correlation of these with the radon implants is a much more difficult and extensive problem.

The present paper is offered as an introduction to these investigations. It deals with a correlation of the effects of permanent or removable radon implants of 1 to 4 mc. and radium needles 7 mm. long (exclusive of eye and point), containing 1 mg. of radium, and filtered by 0.25 mm. of platinum.

The reaction chosen for making this comparison was the bleaching of butter. Various publications from our laboratories[3,6] have discussed this effect, and shown that, under proper conditions, it is proportional to the production of necrosis or the formation of a skin erythema. In this particular problem, where we are dealing with different times of exposure, the fact that the effect is being produced in a lifeless medium is of greater importance than in the experiments already reported. We will return to this point later.

The method of carrying out the experimental work is shown in Figure 1. This is

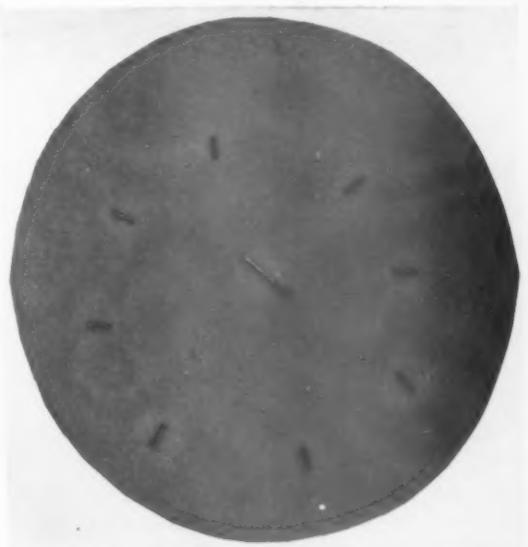


FIG. 1. Butter containing gold radon seeds and platinum 1 mg. radium needle.

* Read at the Fourteenth Annual Meeting, American Radium Society, Portland, Oregon, July 8–9, 1929.

† The difference in the size of puncture necessary, and the question of whether the removable implant stays in place as well as the permanent one, may be mentioned, but are not to be discussed here.

a Petri dish full of butter, containing several radon seeds of varying strengths, and the 1 mg. radium needle. The diameters of the bleached areas were measured daily, and, for each set of seeds, curves were plotted showing the increase of the area with time, for different millicurie strengths of tube, and with millicuries for different times of exposure. Figure 2 shows typical curves. In A, each curve shows the

FIGURE 2

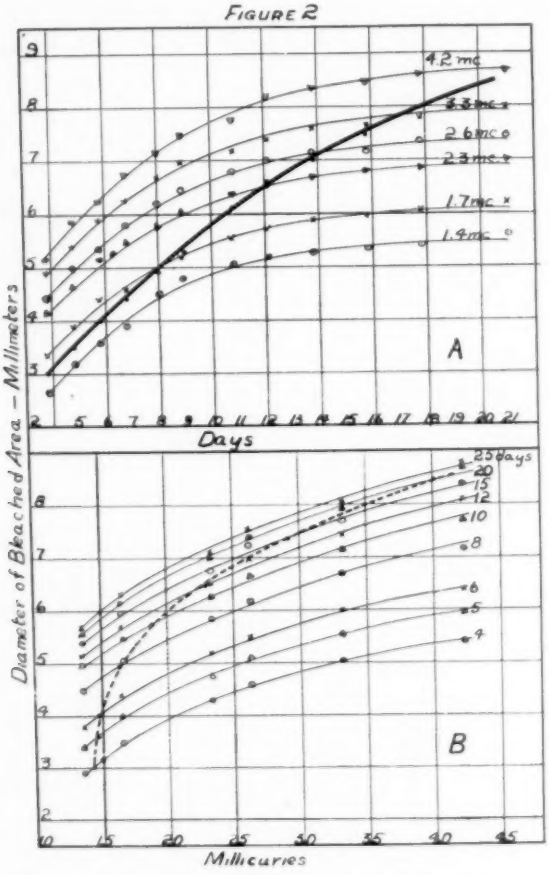


FIG. 2. Increase in diameter of bleached area in butter: A, with time; B, with strength of tube.

increase in diameter for a tube of an indicated millicurie content; the heavy curve shows the increase for the 1 mg. needle. In B, each curve shows the variation in diameter with millicurie content, for a certain day. In this case the dotted curve also refers to the 1 mg. needle, but of course the horizontal coordinates do not apply to this curve. It is obtained by plotting the diameter for the needle for each day on the corresponding radon curve for that day.

Six such sets of experiments were made, and from the curves the millicuries producing the same effect as the 1 mg. needle at any time could be found. For instance, in Figure 2 the diameter of the bleached area produced by 1 mg. after eight days is seen to be the same as that for 2.2 mc. after six days, and for 1.4 mc. after ten days. Although the actual diameters for the various implants were found to vary somewhat from one experiment to another (due to differences in the butter) the relations between the areas for the needles and the various strengths of seeds were found to be nearly the same for all. The average results found are given in Table 1.

TABLE I

MILLICURIES OF RADON REQUIRED, FOR DIFFERENT TIMES OF EXPOSURE, TO PRODUCE THE SAME EFFECT IN BUTTER AS 1 MG. RADIUM NEEDLES, USED FOR VARIOUS TIMES.

Days for Radon	Days for 1 Mg. Radium							
	4	5	6	8	10	12	15	20
	mc.	mc.	mc.	mc.	mc.	mc.	mc.	mc.
4	1.3	1.6	2.0	3.0	3.6			
5	1.0	1.4	1.7	2.4	3.4	3.8		
6	0.9	1.1	1.4	2.0	2.8	3.2	4.0	
8		0.9	1.1	1.6	2.1	2.7	3.4	
10		0.8	1.0	1.3	1.9	2.3	3.1	4.2
12		0.7	0.9	1.2	1.6	2.1	2.9	4.0
15			0.8	1.0	1.5	1.9	2.6	3.8
20			0.8	0.9	1.3	1.7	2.4	3.6
25			0.7	0.9	1.3	1.6	2.2	3.5

From this table can be seen at a glance the number of millicuries necessary to produce the same effect on butter as 1 mg. of radium, for any day from four to permanency (25) for the radon, and from four to twenty for the radium. Each column except the first relates to one definite area for the radium—that produced in the number of days heading the column. The figures in this column indicate the

millicuries necessary to produce the same area in the different numbers of days indicated in the first column.

From the values given in Table I, curves can be developed giving the relations for tubes of any millicurie strength and any number of days within the limits of the experiment. Such curves are shown in Figure 3. The coordinates of any point on any one of the curves indicate the number of days required to produce the same effect on butter by the 1 mg. needle and the radon implant of the strength marked on this particular curve. For example (following the dotted lines on the diagram), an implant of 2 mc. left in for ten days produces the same bleached area in butter as a 1 mg. needle left in for about eleven days. A table for convenient use may be constructed from these curves, such as Table II.

In this table any column indicates the number of days it is necessary to use a seed of the millicurie content indicated at the head of the column, to produce the same effect in butter as the 1 mg. needle for the days indicated in the first column. Or, a horizontal line shows the time necessary for various numbers of millicuries to produce the same effect as 1 mg. for the

FIGURE 3

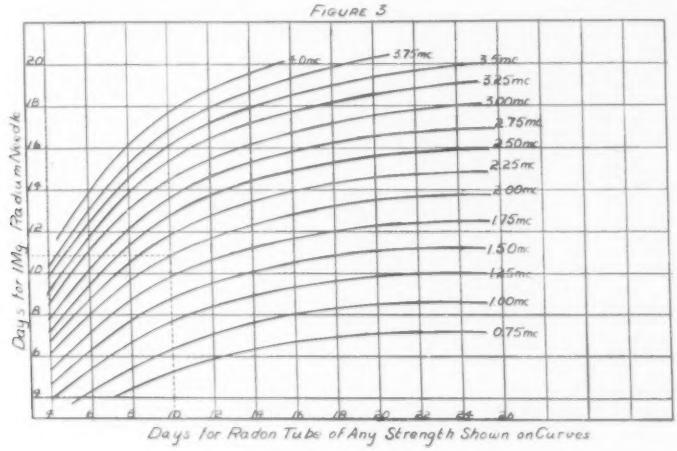


FIG. 3. Time of exposure required for radon seeds of various strengths to produce the same effect in butter as a 1 mg. radium needle.

TABLE II

DAYS REQUIRED FOR RADON SEEDS OF DIFFERENT STRENGTHS TO PRODUCE THE SAME EFFECT IN BUTTER AS A 1 MG. RADIUM NEEDLE USED FOR VARIOUS TIMES.

Days for Radium	Days for Radon												
	1.00 mc.	1.25 mc.	1.50 mc.	1.75 mc.	2.00 mc.	2.25 mc.	2.50 mc.	2.75 mc.	3.00 mc.	3.25 mc.	3.50 mc.	3.75 mc.	4.00 mc.
4	5.3	4.1											
5	7.6	5.4	4.5										
6	9.3	6.8	5.6	4.8	4.1								
7	11.9	8.5	6.8	5.8	5.0	4.3							
8	15.8	10.9	8.3	7.0	6.0	5.4	4.7	4.1					
9		14.4	10.4	8.4	7.1	6.2	5.6	5.0	4.4	4.0			
10		21.0	13.4	10.2	8.4	7.3	6.6	5.9	5.1	4.7	4.1		
12				17.5	13.0	10.2	8.8	7.8	6.8	6.2	5.6	5.2	4.8
15						25.0	16.5	13.1	10.9	9.3	8.4	7.8	7.0

time indicated at the beginning of the line. The information contained in Tables I and II is the same, but in the first case it is referred to whole numbers of days for both radium needle and radon implants, and in the second, to definite millicurie contents for the radon tubes.

The same information may be put on a basis of millicurie- and milligram-hours. This is done in Figure 4. It might be supposed that the same number of millicurie-hours would produce the same effect, no matter what the strength of the source, but it is evident from the figure that this is not the case. The weaker tubes are relatively more efficient. For instance, the area produced by 200 mg-hr. with the 1 mg. needle is equal to that produced in 130 mc-hr. with 1.0 mc., 160 mc-hr. with 1.5 mc., 184 mc-hr. with 2.0 mc., or 200 mc-hr. with 2.5 mc. Just why this should be true, it is difficult to say. We shall consider this question later. Table III presents some of the information from these curves in a convenient form for reference. In this table, for the different millicurie strengths of tubes, are given the millicurie-hours, and days required to produce the same effect in butter as various milligram-hours from the 1 mg. radium needle.

Up to this point we have been dealing strictly with the effects produced in butter by these various types of implants. But the important thing is how these results may be utilized in therapy. As has already been suggested, in the latter case we are dealing with a medium in which growth is constantly going on. It would seem, therefore, that after a certain time, an equilibrium might be established whereby extension of radiation effect would be just counterbalanced by tissue regeneration. After this time, the area of the affected zone would not increase. If this be the case, it is evident that a comparison of two types of implant should be made at about the expiration of this time. In order to do this, it would be necessary to know just how long the affected volume around any implant increases. We should also know whether this time is dependent on the initial strength of the tube, and on the nature of the biological medium.

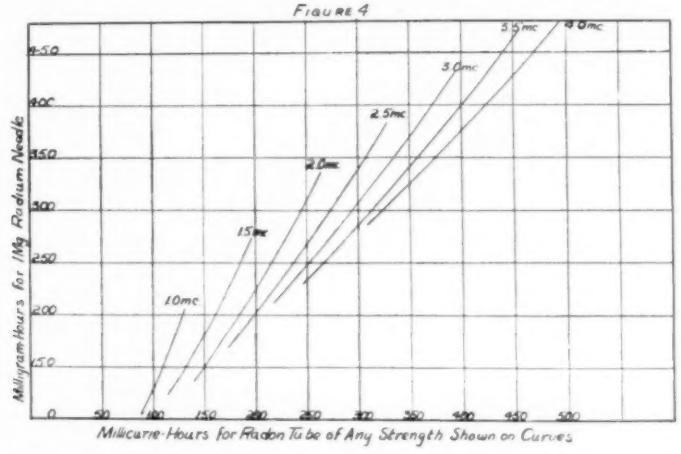


FIG. 4. Millicurie-hours required for radon seeds of various strengths to produce the same effect in butter as a 1 mg. radium needle used for various milligram-hours.

Very little experimental data on these points are available. Lacassagne[4] found no difference in the size of the affected area, whether the implant was left one, two, three, seven, or twelve days. His experiments were conducted on the dorsal muscles of rabbits. Cutler[1] in similar experiments, found no definite increase after the seventh day. None of his animals were sacrificed earlier. Adair,[2] using unfiltered implants in the same type of experiments,

TABLE III

MILLICURIE-HOURS, OR DAYS, REQUIRED FOR RADON SEEDS OF DIFFERENT STRENGTHS TO PRODUCE THE SAME EFFECT IN BUTTER AS 1 MG. RADIUM NEEDLES USED FOR VARIOUS TIMES.

Radium		Radon													
1 mg.		1.0 mc.		1.5 mc.		2.0 mc.		2.5 mc.		3.0 mc.		3.5 mc.		4.0 mc.	
mg-hr.	days	mc-hr.	days	mc-hr.	days	mc-hr.	days	mc-hr.	days	mc-hr.	days	mc-hr.	days	mc-hr.	days
100	4.2	86	5.7												
125	5.2	98	7.5	115	4.7										
150	6.3	110	9.8	132	6.0	158	4.7								
175	7.3	120	13.0	148	7.6	168	5.4	182	4.2						
200	8.4	130	20.0	160	9.0	184	6.7	200	5.0						
225	9.4			173	11.3	200	8.0	218	6.0	230	4.7				
250	10.4			185	15.0	216	9.4	236	7.0	252	5.5	265	4.4		
275	11.5					231	11.3	255	8.0	273	6.5	290	5.2		
300	12.5					246	15.0	274	9.8	294	7.5	312	6.2	325	5.0
325	13.5					258	20.0	290	11.8	314	8.7	335	7.2	350	6.0
350	14.6							308	15.0	335	10.0	357	8.2	375	7.0
375	15.6							324	20.0	354	12.0	378	9.4	400	8.0
400	16.7									373	15.0	400	11.0	424	9.0

was not sure of an increase after the fourth day, but says such an increase might have been masked by other fortuitous variations.

It does not seem plausible that there should be no increase in the affected volume after the first day. The data from which Lacassagne draws this conclusion are probably too limited to justify it. In the experiments of Cutler and Adair, the variations from one animal to another were sometimes greater than the total increase that took place in the butter during the latter part of the life of the tube. Since the actual increase which might be expected here would be small, it might easily be missed on account of such variations. It is evident that this is a point which cannot be settled without a good deal more research with biological material. As to the time in which the nearly maximum effect is reached, it is evident from the curves of Figure 2A, that, in the case of the butter, there is not much increase after the tenth or eleventh day, and that this is true irrespective of the initial strength of the implant, within the limits of the experiment. In the absence of more definite information based on extensive biological experiments, it may be assumed for practical purposes that the affected area in tissue does increase throughout the life of the tube, as in butter, the rate of increase diminishing rapidly after about the tenth day.

With respect to the effect of the initial strength of the needle or seed on the effect produced, we have already mentioned that, as shown in Figure 4, the weaker sources are relatively more efficient. This agrees with the findings of Regaud[5] that, at least under certain circumstances, a small dose delivered over a long period of time is more efficacious than a larger one delivered in a very short time. His explanation is that cells go through various stages of radiosensitivity, and more of them will pass through sensitive stages during long-continued irradiation. The similar result obtained with butter, however, cannot be explained by Regaud's hypothesis, which leads one to think that if such an effect is generally true, it must have a more fundamental basis than Regaud has assumed. It is a very interesting result, which should be investigated further. In view of the

similar effect noted by Regaud, it is perhaps justifiable, for the present, at least, to assume that the weaker sources are biologically more effective, and that the relative effectiveness increases in about the same way as it does in the case of butter decoloration.

If we accept this hypothesis, it is evident that doses administered with implants of different strengths cannot be evaluated in millicurie-hours or milligram-hours, if the initial strength of the implant is different, even though the time element may be the same. Similarly we cannot conclude that the same number of millicurie-hours administered with implants of different strengths, will produce the same biological effect. Accordingly it is much preferable to state the initial strength of each implant and the length of time it remains in place. This is particularly desirable in the case of removable radon implants.

A further consideration with regard to applying butter experiments to clinical dosage should be mentioned here. It is obvious that the volume affected by irradiation depends on the sensitivity of the medium. Previous experiments have shown that the diameters of the bleached portions of the butter, and the necrotic regions in rabbit muscle are not the same, though there is a definite relation between them, under certain conditions. A smaller dose of radiation is required to produce butter decoloration than to produce complete tissue necrosis in the rabbit muscle. The aim of radium therapy in cancer is, in general, not to destroy the growth by the production of actual irradiation necrosis. It is rather to destroy the vitality of the malignant cells so as to cause a complete disappearance of the growth with production of a minimum amount of necrosis. The desired irradiation effect, therefore, will be produced outside the necrotic volume. We believe that the actual diameters of the bleached portion of the butter represent more closely the range of the effective irradiation than the diameters of the necrotic tissue. Naturally in a more radiosensitive tissue, the irradiation effects would be observable at a greater distance from the source than in the case of a resistant tissue. This point will have to be taken into consideration by the clinician, according to his experience in treating different types of tumor.

In view of all these considerations, it is evident that the data here presented cannot be adopted for clinical use without reservations. But, used with discretion, they offer a working basis for the comparison of the various types of needles and implants.

We have already suggested in explaining the tables, how such comparisons may be made for the 1 mg. needle and the seeds. A few examples may make this matter clearer:

(I) A surgeon has been in the habit of using 1 mg. needles and leaving them in place for eight days. He would like to know what strength of removable radon implant he would have to use for the same length of time to produce the same effect. He would also like to know what strength of implant to use if it is to be left in permanently. In Table 1, in the column headed 8 days for 1 mg. radium, we find in the line corresponding to 8 days for radon, 1.6 mc., which is the initial strength of removable implant required. In the line corresponding to 25 days, we find 0.9 mc., which is the initial millicurie strength of the corresponding permanent implant.

(II) As a second example, let us assume that 1 mg. radium needles left in place for seven days will produce a desired effect. How long must 2 mc. radon seeds be left in to produce the same effect? What initial strength of permanent implant is necessary to obtain the same result? In Table II in the column for 2.0 mc. corresponding to 7 days for the radium we find 5.0 days, the time for the 2.0 cm. seed. For the permanent implant, following the same procedure as in Example 1, we find

0.8 mc. (In this case it is necessary to interpolate between the values for 6 and 8 days.)

(III) Gold seeds of 1.5 mc. left in permanently have given a satisfactory result under certain circumstances. How long must 1 mg. needles be left in to obtain the same effect? In Figure 3, on the curve for 1.5 mc., the value for 25 days is found to be the same as for 11.2 days for the 1 mg. needle. Therefore the radium needle should be left in for this length of time.

Besides comparing radon implants with radium needles, these curves may be used to compare radon tubes of different strengths used for different lengths of time, for in Figure 3, all the points on any horizontal line indicate equal effects. Thus we find on the line for 8 days for 1 mg. of radium all the following:

2.75 mc.—	4.1 days
2.5	4.7
2.25	5.2
2.0	6.0
1.75	7.0
1.5	8.2
1.25	10.8
1.0	15.8

Therefore all these radon irradiations produce the same effect. In like manner, the time for any two desired tubes to produce equivalent effects can be found. Table IV presents some of this information for convenience. Here any horizontal line gives the number of days necessary to produce the same effect for the various tubes considered. Each section of the table gives days in whole numbers for one tube, and corresponding times for the others.

Table IV

DAYS REQUIRED TO PRODUCE EQUAL EFFECTS FOR DIFFERENT RADON IMPLANTS

1.0 mc.	1.5 mc.	2.0 mc.	2.5 mc.	3.5 mc.	3.5 mc.	4.0 mc.
days	days	days	days	days	days	days
6.0	4.0					
8.0	4.8					
10.0	6.0	4.0				
12.0	7.0	5.0				
15.0	8.3	5.8	4.7			
perma-						
nent	9.8	6.8	5.3	4.1		
10.0	6.0	4.0				
12.0	7.0	5.0				
15.5	8.5	6.0	4.8			
	12.3	8.0	6.2	4.8		
	18.0	10.0	7.5	5.8	4.8	
		12.0	8.4	6.4	5.4	
		15.0	9.7	7.5	6.2	5.1
		perma-				
		nent	12.0	8.8	7.2	6.0
20.0	9.3	6.5	5.1	4.0		
	12.8	8.2	6.4	5.0	4.0	
	19.0	10.3	7.6	6.0	5.0	4.0
		17.0	10.4	8.0	6.5	5.3
			14.0	10.0	8.0	6.5
			18.5	12.0	9.0	7.3
				15.0	10.5	8.3
				perma-		
				nent	14.4	10.5
	19.0	10.2	7.6	6.0	5.0	4.0
		14.6	9.5	7.3	6.1	5.0
		perma-				
		nent	12.3	9.0	7.3	6.0
			perma-			
			nent	13.6	10.0	8.0
				21.0	13.2	10.0
					17.0	12.0
					24.0	15.0

SUMMARY

Experimental data are presented comparing the bleaching of butter by radon seeds of different strengths, and 1 mg. radium needles, for different times of exposure.

These results are made the basis of a method for clinical comparisons of 1 mg. radium needles and temporary and permanent radon implants of 1 to 4 millicuries.

It is emphasized that this is intended only as a first approximation to an accurate method.

Several examples are presented, showing its practical uses.* †

* The author wishes to acknowledge her indebtedness to Dr. Failla for his suggestion of the problem, and his interest and advice during the course of the work.

† The discussion on this paper will be found in the February number following the paper by Rollin H. Stevens.

REFERENCES

1. Cutler, M. Comparison of the effects of unfiltered and filtered tubes buried in rabbit muscle. Am. J. Roentgenol & Rad. Therapy, 1926, *16*, 535–543.

2. Failla, Adair, Quimby, Sugiura, Arnell, and Goldsmith. Dosage study relative to the therapeutic use of unfiltered radon. Am. J. Roentgenol. & Rad. Therapy, 1926, *15*, 1–35.

3. Failla, G. The development of filtered radon implants. Am. J. Roentgenol. & Rad. Therapy, 1926, *16*, 507–525.

4. Lacassagne, A. Recherches expérimentales sur l'action des rayonnements beta et gamma agissant dans les tissus par radiopuncture. *J. de radiol. et d'électrol.*, 1921, *5*, 160.

5. Regaud, Cl. Quelques fondements radiophysiologiques de la radiotherapie des néoplasms malins. *Paris méd.*, 1925, *15*, 113–125.

6. Quimby, E. H. The intensity of radiation in the vicinity of filtered radon implants. *Radiology*, 1928, *10*, 365–376.

Vol. XXIII, No. 1

A RATIONAL METHOD OF PROCEDURE IN THE IRRADIATION OF MALIGNANT TUMORS*

By L. R. SANTE, M. D.
ST. LOUIS, MISSOURI

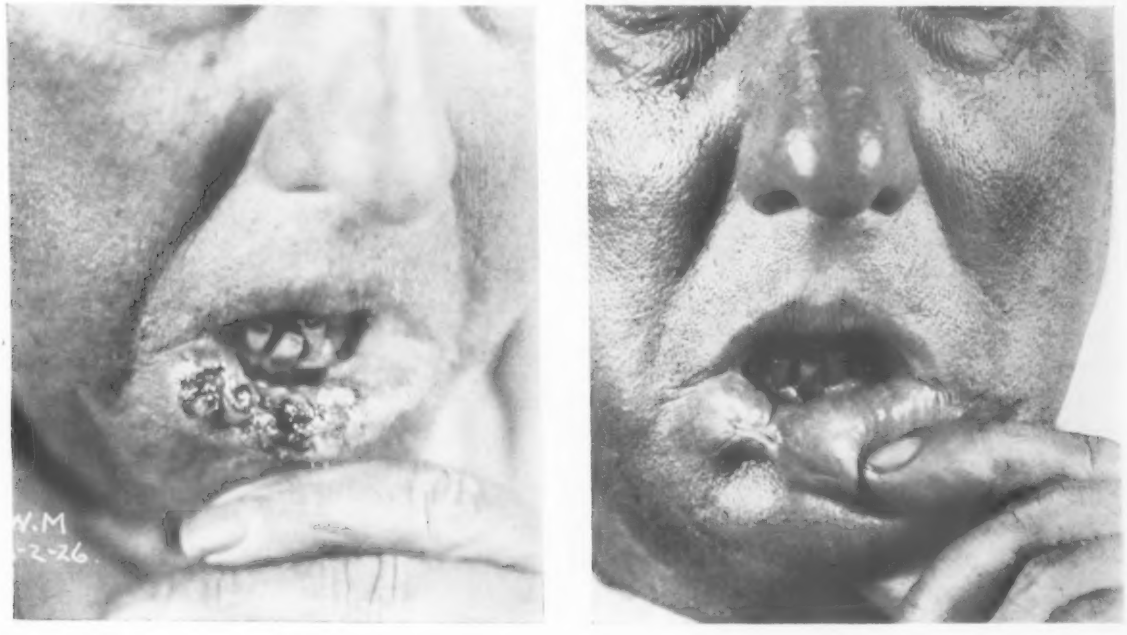
THE biological effect of radiation on living tissues was noted very shortly after the discovery of the radioactive elements. It was soon found that embryonal tissues showed the most pronounced effects from exposure to radiation and that more highly differentiated cells showed less effect. Upon this selective action of radiation our present system of radiotherapy largely depends. That there are other factors which also influence the radiosensitivity of tumors, however, there is no doubt.

Many years have gone by and great advances have been made in our knowledge of malignancy, and in technical methods for its treatment with radiation; yet we do not know today the precise method by which it accomplishes its effect on tumor tissues.

The recent demonstration of the effect of radiation on cell growth in tissue culture by Strangeway and Canti can leave no doubt as to the direct action of radiation on cell structure, or to its selective action on certain cells. That this is not the entire effect of radiation is amply recognized by radiologists. Two other important factors are: cell nutrition and bodily resistance.

Tumors may be destroyed by the action of radiation on their blood vessels, interfering with their nutrition. If these are

* From the Departments of Radiology of St. Mary's Hospital and the St. Louis City Hospital. Read at the Fourteenth Annual Meeting, American Radium Society, Portland, Oregon, July 8-9, 1929.



A B

FIG. 1. Carcinoma involving the lip where it depends entirely upon its blood supply for nutrition may be very readily destroyed by irradiation. Cells derived from the same growth which metastasize to the cervical lymph nodes lie in the lymph spaces and derive their nutrition from the lymph and may be peculiarly resistant to irradiation. A. Squamous cell carcinoma of lip. B. After radium treatment.

young, newly formed vessels, such as occur in highly cellular, rapidly growing tumors, the reaction to irradiation may be very

the cells lie in the lymph spaces and derive their nutrition from the lymph, may be peculiarly resistant. Carcinoma of the tongue,

A B

FIG. 2. The influence of environment on the radiosensitivity of growths has been noted in carcinoma of the lip which has spread to involve the buccal mucous membrane. The portion involving the buccal mucous membrane is more resistant to irradiation than the cutaneous portion. The moist, even temperature of the inside of the mouth may provide a more favorable medium for growth. A. Carcinoma of the buccal mucous membrane. B. After radium treatment.

prompt and effectual, since the young endothelial cells succumb very readily to irradiation. Even tumors composed of more resistant cells may be influenced through interference with their blood supply by the gradual production of endarteritis from the effects of irradiation; the effect under these conditions is more gradual but may be none the less effective.

The environment of the tumor cells may also influence their susceptibility to irradiation, probably largely through an effect on their nutrition. For instance, squamous cell carcinoma located on the lip (Fig. 1) where it depends entirely upon its blood supply for nutrition, may be very readily destroyed by irradiation, whereas, cells derived from the same growth which metastasize to the cervical lymph nodes, where likewise, depends for its nutrition upon its immediate blood supply and in many instances even squamous cell carcinoma in this location responds readily to irradiation. In this instance, also, cells derived from the same growth, when metastatic in the regional lymph glands, may be much more difficult to destroy. To influence metastatic malignancy in lymph glands we must rely upon the direct effect of the radiation upon the cell structure; if the tumor cells are relatively more susceptible than the normal tissue cells, they can be destroyed by irradiation; if they are more resistant, they cannot be destroyed without producing death of the normal tissues in in which they are lodged. The influence of environment on radiosensitivity has also been noted in carcinoma of the lip which

has spread to involve the buccal mucous membrane. It is our impression that when carcinoma of the lip extends beyond the muco-cutaneous margin and involves the buccal mucous membrane it becomes more resistant to irradiation, often requiring two to three times more dosage for destruction than the cutaneous portion of the growth (Fig. 2). The moist, even temperature of the inside of the mouth may provide a more favorable medium for its growth.

A B

Fig. 3. The autolytic type of reaction takes place in embryonal tumors and tumors composed of cells of low differentiation. This is the ideal type of irradiation reaction; large tumors melt away and disappear without necrosis or toxic reaction. A. Basal cell epithelioma of the face. B. After radium treatment.

Still a third factor, bodily resistance, is recognized by some as having effect on tumor growth. By this is meant the resistance offered by the surrounding normal body tissues to the advancement of the disease. That such an influence operates to restrain tumor growth is indicated by the rapid advancement of the disease where this influence is removed in patients who have become cachectic or have lost weight and strength from vomiting or other cause. Whether or not irradiation has any influence on this factor is problematical.

It is generally conceded that there are three more or less distinct types of reaction of tumor tissue to irradiation:

1. Autolytic.
2. Necrotic.
3. Growth-restraining.

The autolytic type of reaction takes place in embryonal tumors or other highly cellular, rapidly growing, vascular tumors, which are nourished by young, newly formed blood vessels (Fig. 3). These tumors melt away and disappear in an incredibly short time after irradiation, without necrosis or toxic constitutional reaction. This may be considered as the ideal irradiation reaction. It has been our experience that such tumors will stand large quantities of radiation, doses even approaching those necessary to produce necrosis in resistant tumors, without themselves undergoing ulceration. We have been able six weeks after irradiation of patients suffering with carcinoma of the cervix with identical amounts of radiation,

to differentiate merely from the subjective symptoms of the patient, those in whom complete regression has occurred with autolytic reaction, and those in whom regression has been incomplete with necrosis. The former have a sense of wellbeing and are free from pain; the latter exhibit clearly their distress and show evidence of a marked toxic reaction.

A B

FIG. 4. The necrotic type of reaction results when highly differentiated resistant tumors are treated with radiation in sufficient doses to cause their destruction. Such tumors may be even more resistant to irradiation than the surrounding normal tissues; doses sufficient to cause death of the tumor cells cause necrosis and ulceration.

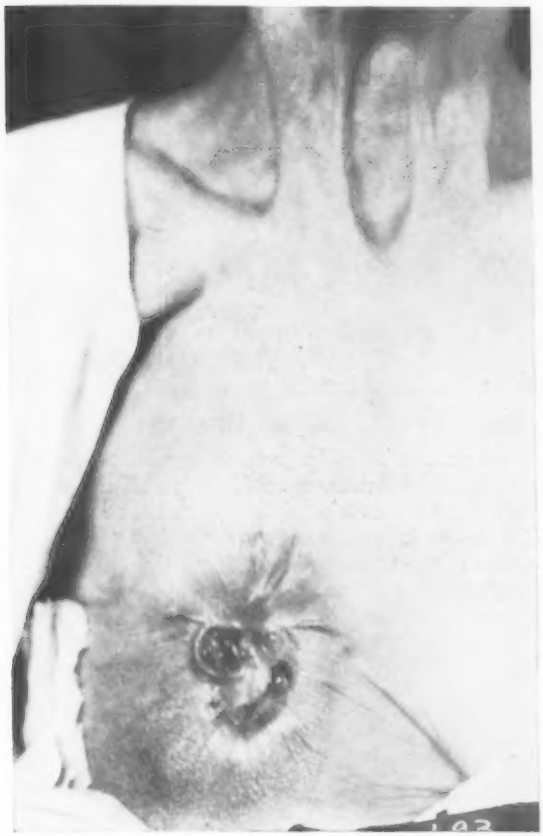
A. Small recurrent carcinomatous growth after breast amputation.

B. An extremely intensive dose was applied well beyond the margin of apparent involvement. The area was later cauterized with actual cautery.

The second, or necrotic type of reaction, results when highly differentiated resistant tumors are treated with radiation in sufficient doses to cause their destruction (Fig. 4). Such tumors may be even more resistant to irradiation than the surrounding normal tissues. Doses sufficient to cause death of the tumor cells, cause necrosis and ulceration. In this type of tumor there is no fine gradation of susceptibility; if the cells are killed, ulceration occurs. No dose is sufficient to produce death of the tumor without necrosis. Unless irradiation is carried well beyond the zone of apparent involvement, viable cancer cells may be found in the very margin of the ulceration. This type of reaction is obviously only applicable to treatment of small growths. There are, of course, many tumors with sensitivity between these two extremes which require varying degrees of irradiation for destruction of their cells.

Lastly, there is the type which we term "growth-restraining reaction" (Fig. 5). This type of reaction is characterized by the production of large amounts of fibrous tissue about the individual cells or the

entire tumor. This dense fibrous tissue capsule chokes off the tumor and restrains its growth. It occurs in resistant tumors



C

Fig. 4. Recurrence of the growth in the margins of the area in spite of drastic treatment.

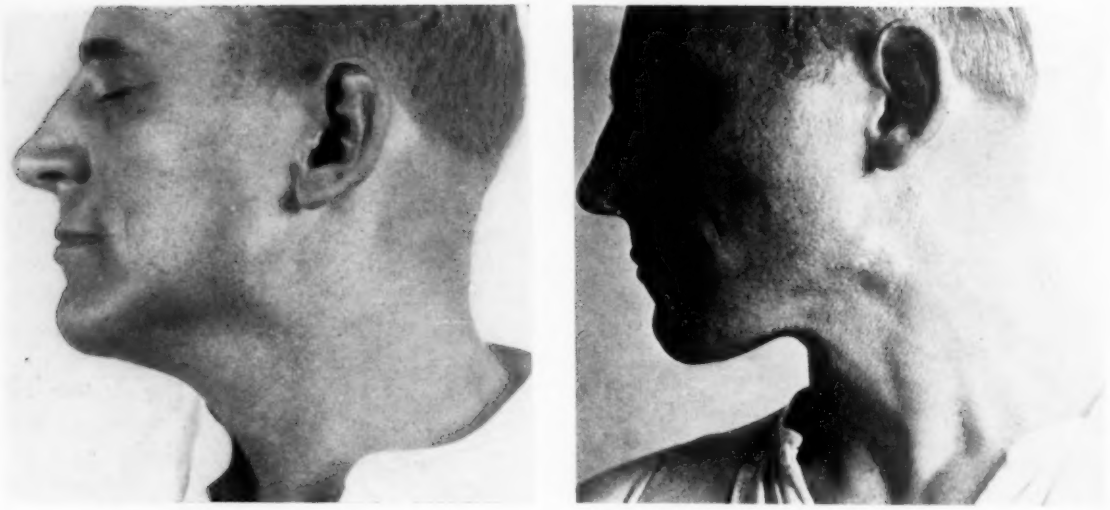
which have developed deep-seated focal necroses from repeated subjection to sublethal doses of radiation over a long period of time, or as a result of intense interstitial irradiation. This is the type of reaction which we must often strive for in resistant tumors which are so large or extensive as to make complete destruction by caustic irradiation impossible.

Since the method of irradiation and the type of reaction depends largely upon the cell structure, blood supply and environment of the tumor, a microscopic examination should be of material assistance. If a section for histological examination is available, this may aid materially in estimating both the degree of malignancy and of radiosensitivity. Such estimates, however, can only be considered of relative value since they are obviously limited by the judgment and experience of the pathologist. In many instances, pathologists themselves do not agree upon the character of the growth and it has been our experience that frequently specimens taken from different locations in the same growth show different characteristics. As a result, any attempt to determine the degree of radiosensitivity of malignant tumors from their morphological characteristics as seen at microscopic examination must have its limitations.

There is, likewise, a wide difference in opinion as to the advisability of subjecting growths to section for microscopic study; often a biopsy is impossible or inadvisable. It has been our rule that, if in order to secure a specimen for microscopic examination it is necessary to break through the surrounding zone of normal tissue, it is much better to forego this information than to subject the patient to the risk of spreading the disease.

If a microscopic examination is not available, we still have access to our previous observations on the radiosensitivity of growths which predominate in any given location. Experience has taught us that we are justly entitled to place reliance on our observations in this regard. For example, epitheliomas occurring on the upper portion of the face are in the large majority of instances composed of basal cells, whereas those occurring on the lower portion of the face are usually made up of squamous cells. Likewise, the macroscopic appearance of these two growths and the tendency of the one to remain localized and the other to metastasize to the regional lymphatics will aid in differentiating between them.

Similarly, our past experience has demonstrated that carcinoma of the uterine cervix is in many instances very radio-



A B

FIG. 5. "Growth-restraining reaction" is characterized by the production of large amounts of fibrous tissue about the individual cells or the entire tumor. This dense fibrous tissue capsule chokes off the tumor and restrains its growth. It occurs in resistant tumors which have developed deep-seated focal necroses from subjection to repeated sublethal doses of irradiation over a long period of time.

A. Metastatic sarcoma in the cervical nodes from sarcoma of the tonsil. These were six in number and varied from the size of a walnut just below the angle of the jaw, to the size of a hickory-nut, just above the clavicle. Appearance before irradiation; the bulging just behind the angle of the jaw from the largest gland is apparent.

B. All but the two larger glands located just behind the angle of the jaw completely disappeared. These two larger masses have become smaller in size and harder in consistency. They have remained unchanged for almost five years and the patient is apparently well.

A B

FIG. 6. "Never consider any malignant growth, no matter how small it may be or how slight the involvement may seem, to be insignificant."

A. Small apparently insignificant epithelioma of the face.

B. In spite of intensive irradiation many times the amount which would ordinarily be used for such a lesion, the growth contined to spread. The condition of this patient is much worse than is indicated in this photograph, the zygomatic arch and antrum being involved.

sensitive, regardless of the type of cells which the pathologist may report from histological examination.

A B

Fig. 7. "Never consider any malignant growth, no matter how large or extensive it may seem, to be hopeless until it has been given the test of irradiation."

A. Extensive malignant growth which has destroyed the left cheek, anterior wall of antrum and upper jaw, left half of the nose, left lower eyelid and has encroached upon the right eye.

B. Tumor was destroyed by radium in six weeks. No attempt at plastic repair was made for two years to be sure that no recurrence would result. Since this time plastic operative procedure has been undertaken and the defect is in process of repair. Treated with advice and assistance of Dr. Sanford Withers.

On the other hand, carcinoma of the breast is most frequently of adenomatous type which is very refractory to radiation therapy. In this way the tumors of each region of the body can be analyzed in the light of past experience and the problem of their treatment by irradiation can at least be approached with a greater degree of accuracy.

There must necessarily be many tumors in which no conclusion can be reached as to the degree of radiosensitivity from any of the methods at our command. A good dictum to follow is: Never consider any malignant growth, no matter how small it may be or how slight the involvement may seem, to be insignificant (Fig. 6); and conversely, never consider any malignant growth, no matter how large or extensive it may seem, to be hopeless until it has been given the "test of irradiation" (Fig. 7). By "test of irradiation" is meant the application of a single intensive course within the tolerance dose of irradiation, to the tumor and observing it for three or four weeks for signs of regression.

If complete regression follows this single

dose, the tumor can be considered as being of the very sensitive type, either embryonal or of the highly vascular, rapidly growing variety. The regression produced was probably effected by direct action on the cells themselves, or on the highly susceptable endothelial cells of the newly formed blood vessels. Tumors of this type usually succumb to smaller doses, but it has been our experience that they will withstand almost as much irradiation as resistant tumors without undergoing ulceration. Further irradiation may be administered as a safeguard, but the chances are that the first application is all that will be necessary.

If the tumor shows partial regression, this would indicate that the cells are at least somewhat more sensitive to irradiation than normal body tissues and steps should be taken for the application of further irradiation. This can be accomplished either by the application of more vigorous treatment following the saturation method advocated by Pfahler, or by utilizing interstitial irradiation, keeping within the tissue tolerance dose.

If no regression whatever is seen, it is doubtful if any amount of radiation short of that capable of producing necrosis of normal body tissues will suffice to bring about destruction of the tumor. Only the most intensive irradiation with unfiltered or very slightly filtered rays, applied well beyond the margins of the growth, can be expected to produce destruction of the tumor. If the tumor is small and accessible, and is not located in a vital part, this method of treatment may be carried out, but if it is large, this procedure is out of the question and recourse must be had to the saturation method advocated by Pfahler in the hope of producing growth restraint.*

* The discussion on this paper will be found in the February number following the paper by Rollin H. Stevens.

VOL. XXIII, NO. 1

AN UNUSUAL CASE OF OSTEOGENIC SARCOMA

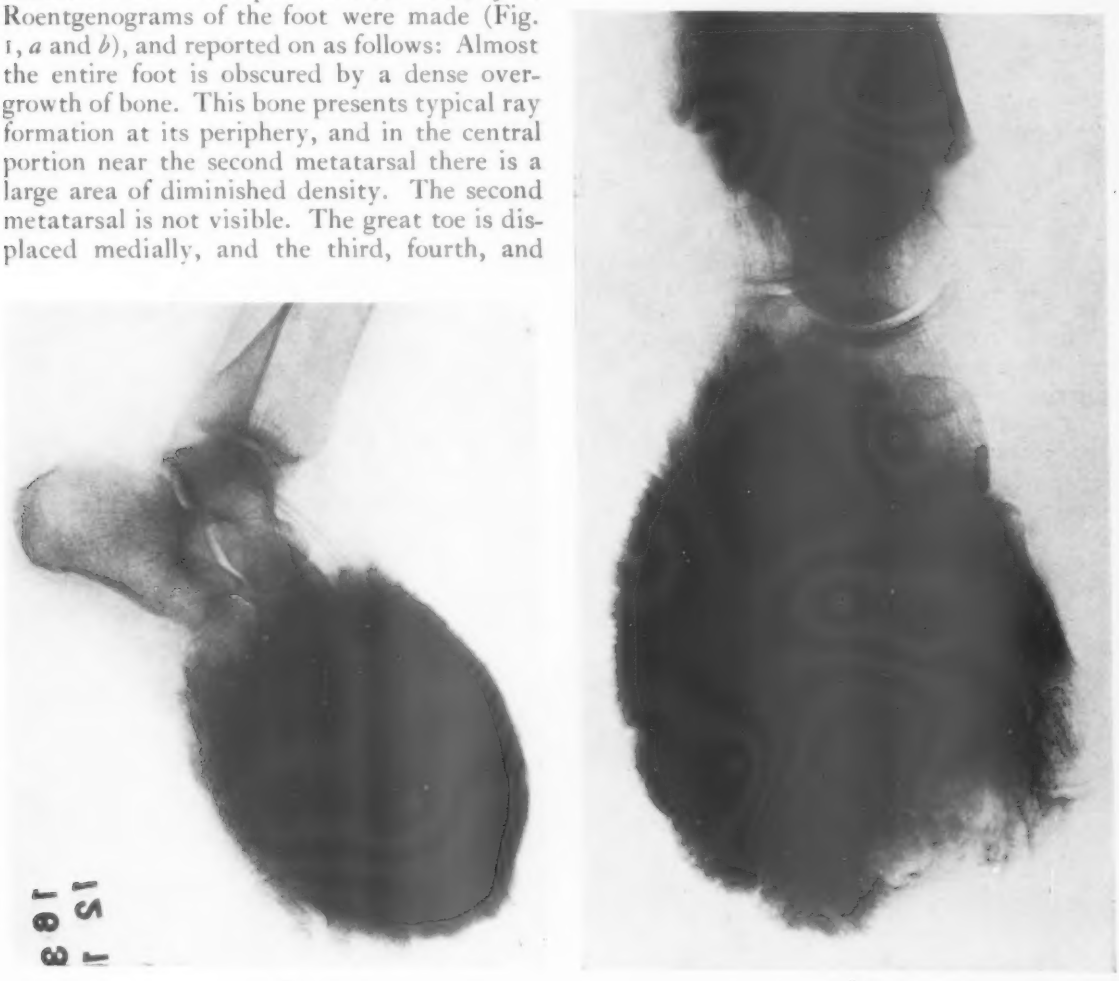
By RICHARD DRESSER, M.D., *and* CHARLES DUMAS, M.D.
Pondville Hospital at Norfolk (*Massachusetts State Cancer Hospital.*)
WRENTHAM, MASSACHUSETTS

A GREEK shoemaker, aged forty, was admitted to the Massachusetts General Hospital in August, 1914. At this time a small tumor was removed from the second metatarsophalangeal joint. The pathological diagnosis was osteochondroma.

The patient remained perfectly well until 1928 when he noticed a non-tender swelling at the site of the old amputation. This increased very rapidly in size, and became more and more painful. He again came to the Massachusetts General Hospital in December, 1928. Roentgenograms of the foot were made (Fig. 1, *a* and *b*), and reported on as follows: Almost the entire foot is obscured by a dense overgrowth of bone. This bone presents typical ray formation at its periphery, and in the central portion near the second metatarsal there is a large area of diminished density. The second metatarsal is not visible. The great toe is displaced medially, and the third, fourth, and fifth toes are displaced laterally. The findings are those of a sclerosing osteogenic sarcoma, arising from the second metatarsal.

At this time a film of the chest showed no evidence of metastases.

Mid-leg amputation was performed, and the patient was discharged from the hospital in January, 1929. The pathological report on the specimen was as follows: A slowly growing bone sarcoma of a sclerosing type which probably originated from the bony and cartilagin-



a *b*

FIG. 1, *a* and *b*. Sclerosing osteogenic sarcoma arising at the site of a benign osteochondroma.

FIG. 2. Metastasis, first lumbar vertebra, from osteogenic sarcoma.

ous tumor removed in 1914. There is some similarity in the microscopic structure of the two growths.

The patient returned in April, 1929, complaining of severe pain in the right chest. A roentgenogram showed definite pulmonary metastases. The symptoms were not relieved by irradiation with high voltage roentgen rays, and the patient was transferred to the State Cancer Hospital at Pondville. Routine roentgenographic examination of the entire skeleton and chest showed a pronounced increase in the extent of the pulmonary metastases, and in addition there was discovered a pathological process involving the first lumbar vertebra (Fig. 2). There was definite narrowing and wedging of the vertebral body, with preservation of the intervertebral spaces above and below. This was thought to be due to metastatic malignancy.

The patient failed rapidly, and death occurred May 20, 1929.

Autopsy confirmed the roentgen findings. There were extensive pulmonary metastases, metastases in the right kidney, and a metastatic focus in the first lumbar vertebra.

DISCUSSION

This case presents two unusual features: (1) The development of a malignant bone tumor at the site of a supposedly benign lesion which was removed fourteen years previously. This affords an argument for more radical treatment of benign bone tumors.

(2) The occurrence of bone metastases. The Registry of Bone Sarcoma has very kindly reviewed their cases in an effort to determine the frequency of skeletal metastases. The records are not sufficiently complete to afford statistical data, but we may conclude that bone metastases in osteogenic sarcoma are extremely rare.

THORACIC STOMACH*
CASE REPORT

By Clinton G. Lyons, M.D.
Roentgenologist, Edward Hines Jr. Hospital
HINES, ILLINOIS

FIVE cases in which the stomach has been found lying above the diaphragm during roentgen examination have been recorded. One case was reported by Bailey, but this was a post-mortem discovery; two by LeWald; one by Roberts and another by Morris. I wish to add the sixth case to those which have already been discovered roentgenologically.

The patient a male, aged forty, was referred to me for roentgen examination of the chest by Dr. John B. Warden, the Personnel Officer of the Edward Hines Jr. Hospital, for a suspected fracture of the rib received while boxing in the hospital gymnasium.

The man is employed at this hospital as an elevator operator, claims he has no nausea, vomiting or other gastric symptoms, bowels regular, appetite good; inspection, palpation and percussion failed to reveal anything of an unusual nature.

The stereoscopic roentgenograms of the chest at 6-foot distance revealed the bony framework to be barrel-shaped and symmetrical, showing no evidence of old or recent injury; also no scoliosis, kyphosis, forked ribs or narrowing of intercostal spaces.

The silhouette or cardiac image is within normal size, shape and position for the type of chest. Contour of the heart shadow is regular in outline exhibiting no bulging, displacement or other evidence of organic pathology.

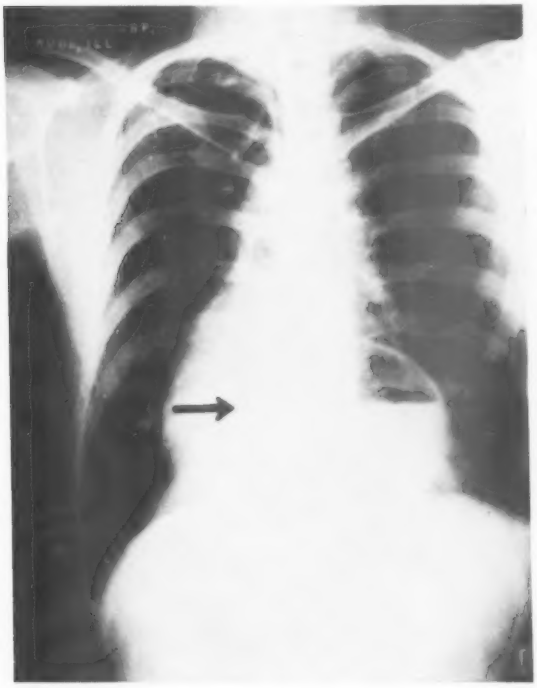


Fig. 1. A fluid level in the thoracic stomach.

Fig. 2. Lateral view of the chest showing no trace of fluid in the thoracic stomach.

* Published by authority of Charles M. Griffith, Acting Medical Director, United States Veterans Bureau.

Fig. 3. The barium-filled stomach revealing an hour-glass shape, with the superior end above the dome of the right diaphragm.

Fig. 4. Displaying free fluctuation of the barium mixture on bending to the left and to the right, interchanging from the abdominal to the thoracic cavity.

Contours of the domes of the diaphragms are smooth, showing no evidence of fluid, adhesions or thickened pleurae. The costo-diaphragmatic cul-de-sacs were observed separately and comparatively, displaying deep and acute angles bilaterally.

The lung fields are radiant throughout all zones, with the exception of a few clusters of calcified areas in the hilar regions, and a moderate amount of peribronchial thickening and extension of the heavier truncal shadows, simulating the findings of chronic bronchitis. The apices and peripheral lung zones are radiant.

An abnormal shadow, the size of a grapefruit, is seen in the median line of the thoracic cavity and in front of the heart image which contains a fluid level. This fluid was observed to fluctuate on movement under the roentgenoscope and to change shape with the change of position of patient (see Figs. 1 and 2).

The ingestion of an opaque meal reveals the barium passing the esophagus without hesitation and entering the stomach normally. After a few swallows of barium a portion of the meal

Fig. 5. The barium enema displays no haustrations or loops above the dome of the diaphragm.

was seen to shoot upward and occupy a position in the thoracic cavity. On bending the patient to the left and right the meal formed an hour-glass appearance and fluctuated freely from the abdominal to the thoracic cavity (see Figs. 3 and 4).

The opaque clysma filled the rectum and sigmoid normally before taking a slow ascent to a high position of the splenic flexure. The head of the column made an inward loop, descended slightly before taking a transverse course, crossing the abdomen opposite the region of the second lumbar vertebra to the median line where an abrupt descent was observed, the head of the column following the course of the lumbar spine to the low position of the cecum. No haustrations or loops seen above the diaphragm (Fig. 5).

The colon was freely movable throughout, haustrations regular in outline and of even width, displaying no evidence of organic pathology.

Diagnosis: 1. Diaphragmatic hernia. 2. Thoracic stomach.

REFERENCES

1. Bailey, P. *Anat. Rec.*, 1923, *17*, 107–109.
2. LeWald, L. T. Thoracic stomach. *Radiology*, 1924, *3*, 91–104.
3. LeWald, L. T. Roentgenological diagnosis of diaphragmatic hernia. Am. J. Roentgenol. & Rad. Therapy, 1928, *20*, 423–430.
4. Morris, Hugh. *Radiology*, September, 1929, *13*, 265–266.
5. Roberts, R. E. A case of thoracic stomach. *Brit. J. Radiol.*, 1927, *32*, 17–19.

AN UNUSUAL ABDOMINAL TUMOR

By PHILIP H. COOK, M.D.

Roentgenologist to Worcester City and Memorial Hospitals

WORCESTER, MASSACHUSETTS

Miss R. M. K., aged forty-four, employed as accountant by a large life insurance company, was referred to me on Oct. 5, for examination of gastrointestinal tract. Below the costal margin on the right was an easily palpable tumor about the size of an orange, strongly suggesting an enlarged gall-bladder in its character. The patient, a very intelligent woman, asserted that the mass had been present to her knowledge only three weeks.

Roentgen examination (Fig. 1) showed stomach and duodenum apparently normal, but entirely to the left of the spine; the descending duodenum was narrow as if from pressure. To the right of the spine was an oval shadow, its lower pole at the level of the fourth interspace, and filling the full width of that side; in a position corresponding to the renal hilus was a calcified area 3 cm. in diameter, borders not sharply demarcated. The six-hour observation showed no gastric residue with no downward displacement of the hepatic flexure; motility at twenty-four hours was normal and nothing else of interest was shown. Graham test was not done.

A tentative diagnosis of enlarged kidney was made and the patient referred to Memorial Hospital for further study. Attention was drawn, on more careful observation, to the fact that the width of the spine lay between the tumor and the organs which it was evidently displacing; a pyelographic examination was therefore undertaken. This (Fig. 2) showed on the left a normal pelvis and calyces in proper position. The right ureter extended sharply inward and upward from the sacroiliac level, completely across the spine, to a somewhat enlarged and distorted pelvis opposite the space between the second and third vertebrae on the

FIG. 1. Shows tumor on right; displacement of pylorus and duodenum to the left.

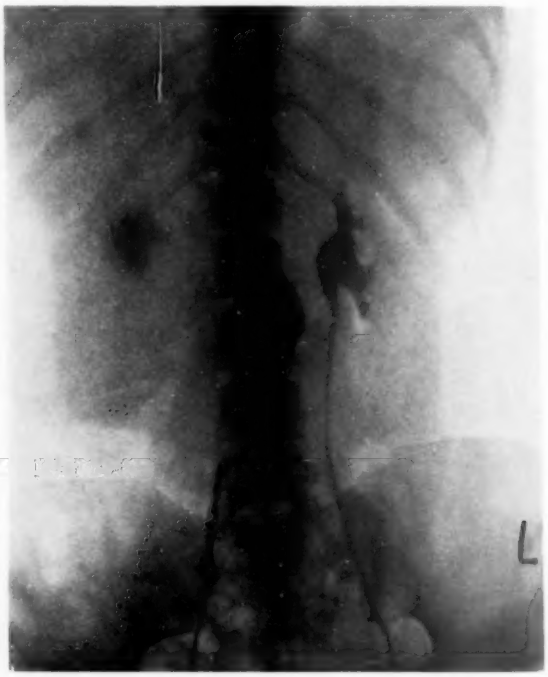
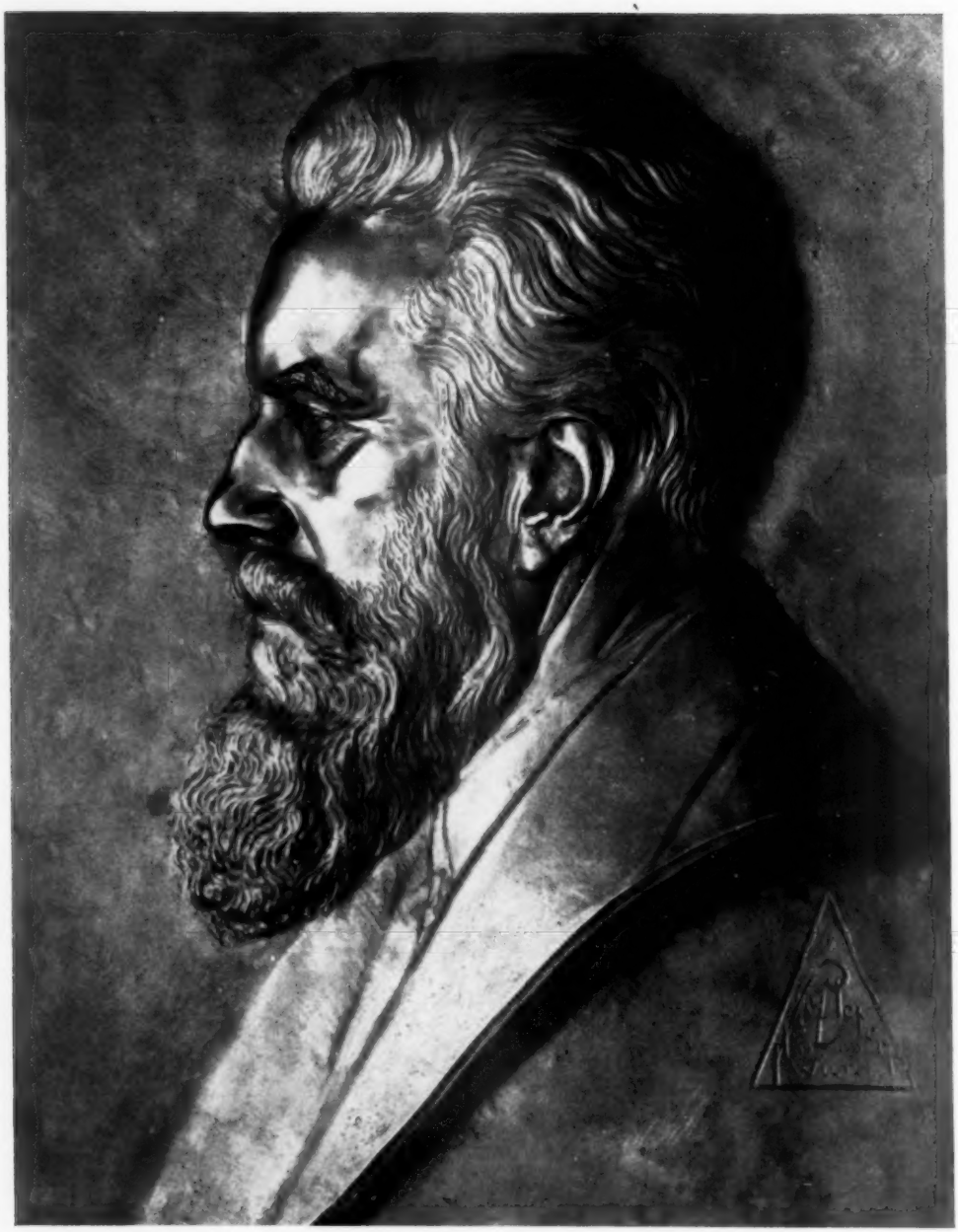


FIG. 2. Shows displacement of right kidney, accounting for space between tumor and duodenum.

left. The tumor was shown as before, and was very evidently extrarenal.

Operation was performed on Oct. 12 by Dr. Wm. H. Rose. The tumor was found to be retroperitoneal, and to consist of an aggregation of smaller ones, estimated at five in number, one of which was calcified. The tumor tissue was very friable; during the exploration several hemorrhagic areas were found, suggesting a possible explanation for the patient's assertion of its rapid growth in size. Her condition on the table was not good, and this and the character of the growth deterred the surgeon from attempting complete removal. She died on the fourth day after operation, from embolism. The tissue removed was reported by the hospital pathologist as fibrosarcoma.



William Konrad Roentgen
1845–1923
from the bronze bas-relief by Heinz Peter

Vol. XXIII, No. 1

THE AMERICAN JOURNAL OF ROENTGENOLOGY AND RADIUM THERAPY

Editor: LAWRENCE REYNOLDS, M.D.

Editorial Board: JAMES T. CASE, M.D. H. K. PANCOAST, M.D. WILLIAM DUANE, PH.D.
Advisory Board for Pathology: JAMES EWING, M.D. EUGENE OPIE, M.D. A. S. WARTHIN, M.D.

Collaborating Editors: The Officers and Committee Members of the Societies of which this JOURNAL is the official organ, whose names appear on this page, are considered collaborating editors of this JOURNAL.
Foreign Collaborators: A. BÉCLÈRE, M.D., PARIS. GÖSTA FORSSELL, M.D., STOCKHOLM. G. F. HAENISCH, M.D., HAMBURG. R. LEDOUX-LEBARD, M.D., PARIS.

Publisher: CHARLES C THOMAS, SPRINGFIELD, ILL.

Issued Monthly. Subscription $10.00 per year, $11.00 in Canada and $12.00 in foreign countries. Advertising rates submitted on application. Editorial office, 110 Professional Building, Detroit, Mich. Office of publication, 220 E. Monroe St., Springfield, Ill. Information of interest to all readers will be found on page iv.

Officers and Standing Committees

THE AMERICAN ROENTGEN RAY SOCIETY

President: H. M. IMBODEN, New York City; *President-Elect:* A. B. MOORE, Rochester, Minn.; *1st Vice-President:* H. E. RUGGLES, San Francisco, Calif.; *2d Vice-President:* B. H. NICHOLS, Cleveland, Ohio; *Secretary*: JOHN T. MURPHY, 421 Michigan St., Toledo, Ohio; *Treasurer:* WILLIAM A. EVANS, 10 Peterboro St., Detroit, Mich.; *Librarian and Historian:* H. W. DACHTLER, Toledo, Ohio.

Executive Council: W. F. MANGES, Chairman, 235 S. 15th St., Philadelphia, Pa., L. R. SANTE, St. Louis, Mo., F. M. HODGES, Richmond, Va., H. M. IMBODEN, New York City, A. B. MOORE, Rochester, Minn., LAWRENCE REYNOLDS, Detroit, Mich., JOHN T. MURPHY, Toledo, Ohio, WILLIAM A. EVANS, Detroit, Mich.

Committee on Laws and Public Policy: B. R. KIRKLIN, Chairman, Rochester, Minn., FRED M. HODGES, Richmond, Va., WILLIAM E. CHAMBERLAIN, San Francisco, Calif.

Committee on Safety and Standards: P. M. HICKEY, Chairman, University Hospital, Ann Arbor, Mich., H. K. PANCOAST, Philadelphia, Pa., W. D. COOLIDGE, Schenectady, N. Y., A. U. DESJARDINS, Rochester, Minn., H. J. ULLMANN, Santa Barbara, Calif., B. H. NICHOLS, Cleveland, Ohio, G. E. RICHARDS, Toronto, Canada, R. R. NEWELL, San Francisco, Calif.

Publication Committee: WILLIAM A. EVANS, Chairman, Detroit, Mich., W. F. MANGES, Philadelphia, Pa., L. R. SANTE, St. Louis, Mo.

Leonard Prize Committee: P. M. HICKEY, Chairman, Ann Arbor, Mich., W. B. BOWMAN, Los Angeles, Calif., A. C. CHRISTIE, Washington, D. C., W. A. EVANS, Detroit, Mich., G. W. GRIER, Pittsburgh, Pa., B. H. NICHOLS, Cleveland, Ohio, G. E. PFAHLER, Philadelphia, Pa.

Tube Committee: DAVID R. BOWEN, Chairman, Philadelphia, Pa., I. H. LOCKWOOD, Kansas City, Mo., E. C. ERNST, St. Louis, Mo., G. W. GRIER, Pittsburgh, Pa., E. A. POHLE, Madison, Wis.

Member, National Research Council: W. F. MANGES, Philadelphia, Pa.

Delegate to Third International Congress, Paris, July 27–31, 1931: P. M. HICKEY, Ann Arbor, Mich.; Alternate, LEOPOLD JACHES, New York City.

Editor: LAWRENCE REYNOLDS, 110 Professional Building, Detroit, Mich.

Editorial Board: JAMES T. CASE, H. K. PANCOAST, WM. DUANE.

Advisory Board for Pathology: JAMES EWING, EUGENE OPIE, ALDRED S. WARTHIN.

Publisher: CHARLES C. THOMAS, 220 East Monroe St., Springfield, Ill.

Thirty-first Annual Meeting: West Baden, Indiana, Sept. 23–26, 1930.

THE AMERICAN RADIUM SOCIETY

President: H. H. BOWING, Mayo Clinic, Rochester, Minn.; *President-Elect:* H. J. ULLMANN, Santa Barbara, Calif.; *First Vice-President:* SANFORD WITHERS, Denver, Colo.; *Second Vice-President:* EDITH H. QUIMBY, New York City; *Secretary:* G. W. GRIER, Jenkins Arcade, Pittsburgh, Pa.; *Treasurer:* ZOE A. JOHNSTON, Jenkins Arcade, Pittsburgh, Pa.

Executive Committee: ALBERT SOILAND, Chairman, 1407 S. Hope St., Los Angeles, Calif., CURTIS F. BURNAM, Baltimore, Md., EDWIN C. ERNST, St. Louis, Mo.

Program Committee: H. J. ULLMANN, Chairman, 1520 Chapala St., Santa Barbara, Calif., R. L. SANTE, St. Louis, Mo., WILLIAM NEILL, Baltimore, Md.

Publication Committee: H. K. PANCOAST, Chairman, University Hospital, Philadelphia, Pa., HENRY SCHMITZ, Chicago, Ill., JAMES T. CASE, Chicago, Ill.

Research and Standardization Committee: G. FAILLA, Chairman, Memorial Hospital, New York City, H. J. ULLMANN, Santa Barbara, Calif., R. B. GREENOUGH, Boston, Mass.

Education and Publicity Committee: SANFORD WITHERS, Chairman, Majestic Bldg., Denver, Colo., G. E. PFAHLER, Philadelphia, Pa., T. D. QUIGLEY, Omaha, Nebr.

Fifteenth Annual Meeting: Book-Cadillac Hotel, Detroit, Mich., June 23–24, 1930.

Committee on Arrangements: R. E. LOUCKS, Chairman, 337 W. Grand Blvd., Detroit, Mich., R. H. STEVENS, Detroit, Mich., L. B. ASHLEY, Detroit, Mich.

EDITORIALS

THE JOURNAL

BEGINNING with this issue, the Journal will be published by Charles C. Thomas, of Springfield, Illinois. The general appearance of the Journal will remain as heretofore but it is desirable to point out some of the features which we hope will prove advantageous. The type which has been chosen is the Caslon. Type of this character was first cut by William Caslon and has been used in England since 1734, and after two centuries the type foundry still exists and is owned by the descendants of William Caslon. Updike* states that Caslon "modelled his letters somewhat on the Dutch types but they were much better because he introduced a variety of design and delicacy of modelling which few of the Dutch types possessed. . . . The letters when analyzed especially in the smaller sizes are not individually perfect, but in mass their effect is agreeable" and to use a phrase coined apropos of this style of type by the great English bibliographer, Dibdin, they are "comfortable," and to quote again from Updike, they "represent the flowering of a sturdy English tradition in typography. Lacking a 'national' form of letter, we in America (who are mainly governed by English printing traditions) have nothing better."

With the change in the style of type used there is a slightly wider interspacing of the lines which will make reading somewhat easier. To add to this ease in reading a dull coated paper is used. This paper, in addition, has features of permanency which are desirable and illustrations will reproduce well on it. The average number of pages for each issue will run from 112 to 128 pages of text and illustrations, which is a slight average increase over the preceding numbers.

The abstract section which has always been a very important feature of the Journal will be continued and will be enlarged to include all the journals which should be of interest to roentgenologists. Certain minor changes are made in the arrangement of the abstract section such as a slightly more detailed anatomical grouping of the abstracts, and in addition the abstracts in each number will be indexed. The number of abstracts which we are able to publish in each number is made possible by the splendid cooperation of the members of the Society who have given freely of their time and energy.

It will be the policy in the future to furnish contributors of an article fifty reprints without charge.

As may be seen these changes represent no great departure from the well-established policy of the Journal but such changes as have been made we hope will improve the Journal in certain minor details. The business arrangement which the Publication Committee has made with the publisher enables the Society to have a more direct concern in the earnings of the Journal.

For those of us who have to do with the actual editing of the Journal, it will be our aim and desire to maintain the Journal at its present high standard and to avail ourselves of such opportunities as may arise to improve it. In this we are not unmindful of the task that lies before us, a task which, however, will be made much easier by the capable editors who have preceded us.

* Updike, D. B. Printing Types: Their History, Forms and Use. Harvard University Press, Cambridge, 1927. Vol. I and II. Vol. II. pp. 101–102.

BRONZE OF ROENTGEN

IN DR. HOLZKNECHT'S amphitheatre in the Allgemeine Krankenhaus of Vienna hangs a striking bronze of Roentgen, executed by Heinz Peter. This seemed such an appropriate decoration that the writer was anxious to procure a copy. It was learned that the bronze in question was an original, and a special gift to Dr. Holzknecht, and that no reproduction would be available. However, the artist was consulted and a commission was given for a new work.

This arrived just before the recent Annual Meeting in New York and was given a place on the platform of the assembly room, where it was much admired. So much interest was shown that it seemed desirable to publish a photograph of the bronze and this brief notice.

The bronze, which is 14″×17″ in size, is cast in material of rich gold color and is highly burnished. It is most attractive and of high artistic merit. Copies may be obtained from the artist through the undersigned or his address will be furnished upon request.

William A. Evans

A GIFT FROM DR. FRANCIS H. WILLIAMS

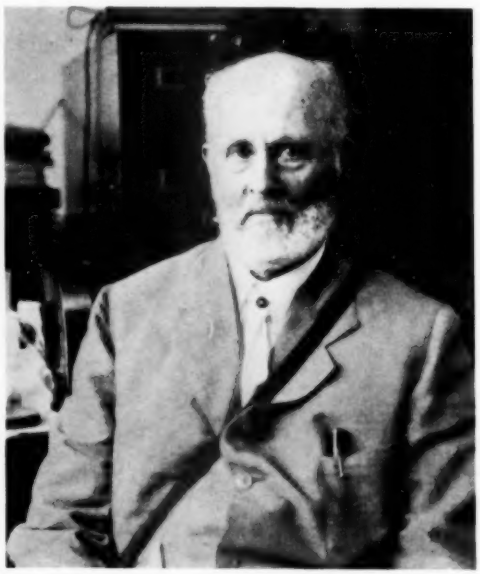
THE page in the Journal carrying the list of officers and standing committees contains, among others, the office of Librarian and Historian which has for a long time been held by Dr. H. W. Dachtler of Toledo, Ohio. The real importance of this office to the Society is we feel not fully appreciated. For many years Dr. Dachtler has been gathering together much material which is invaluable as records of the Society.

Among the recent acquisitions to the library is a splendid gift from Dr. Francis H. Williams in the form of a card index system, consisting of sixteen card transfer cases, containing some 10,000 articles of the early roentgen-ray literature. The cards are arranged alphabetically under the authors' names and contain frequent comments on the value or lack of value of the article itself and in many cases an abstract of the article. The earliest references in the index are those appearing in the first edition of Dr. Williams' book "The Roentgen Rays in Medicine and Surgery" published in 1901. This book is considered of the greatest historical value as it stands as one of the great achievements in American roentgenology. Written in the early years of our specialty, it may be read with profit today after nearly thirty years of progress and development.

Following this, the index continues the subject with references dating from 1901. The references contain the names of men who were well known at that time but who are less familiar to many who have been specializing in roentgenology during the last fifteen years. It also contains the names of those better known to us such as Leonard and Caldwell and all the others of the early days of roentgenology in this country. The index also contains the names of prominent European writers on the subject of roentgenology. Among many of the interesting references is one published by J. B. Guthrie in the *New Orleans Medical and Surgical Journal* of 1902 reporting the simultaneous use of two or more tubes in roentgen therapy.

Altogether it was a very happy thought on the part of Dr. Williams to give this valuable index to the Society and we wish to express the Society's appreciation. Let us hope that Dr. Williams' generous example may stimulate others who have valuable historical material dealing with roentgenology to deposit it with the Society's librarian where it will be accessible to those who are interested in the historical development of roentgenology in this country.

WILLIAM ROLLINS (1852-1929)



ONE of the pioneers in the study of roentgenology following Professor Roentgen's epoch-making discovery in December, 1895, William Rollins became one of the foremost investigators of that period by his contributions to the literature on X-light.

He was born June 19, 1852, son of Sarah Stearns (Patterson) Rollins and John Rodman Rollins, second mayor of Lawrence, Massachusetts, who served his country in the Civil War.

A graduate of the Harvard Dental and Medical Schools, Dr. Rollins practised dentistry, for which he was well fitted by his mechanical tastes and love of technical precision, and achieved distinguished eminence in his profession. His interest in science led him to profound studies in physics and chemistry; he was not moved, however, by a love of knowledge for its own sake, but rather was striving to know the mysteries that others might use the knowledge gained to diminish the suffering of mankind.

He foresaw the far-reaching benefits which Roentgen's discovery was destined to give to medicine—a vision which the years have fully justified. In the new field thus offered, he pursued his investigations with characteristic thoroughness. Numerous reports of his research and experiments appeared in various medical and scientific journals. These reports and experiments he published in book form in 1904 under the title of "Notes on X-light."

His idealism of service, which was his inspiration, is disclosed in the preface to this book: "In these notes are recorded some impressions derived from experiments made after the day's work as a recreation, yet with the hope of learning to design and construct apparatus for my friend, Dr. F. H. Williams, who has done most to show the importance of X-light in medical diagnosis."

How well his modest hope was fulfilled is attested by the fact that his designs of apparatus, and his axioms as to the manipulation of X-light appear as the work of a master, whose plans and principles are the basis of modern roentgen-ray technique, the source from which much of the present-day apparatus has been developed.

He visualized not only the future value of the roentgen ray in medicine and gave directions for its use, but also realized the dangers attendant upon the misuse of this powerful agent, and prescribed safety methods for the operator and patient.

During the year 1900 he made experiments with radioactive substances which led him to believe in the value of radium as a therapeutic agent and he endeavored to obtain further information in that direction with a view to its use in the treatment of certain diseases. In this case, as in that of the roentgen ray his belief has been justified.

Dr. Rollins' work was inspired by the ideal of service, directed by vision, and

characterized by practicality, precision, and completeness. By this we may know the man. In the hope that others may follow the trail of research he has marked out, to ends useful to mankind, he established a generous foundation at the Smithsonian Institution. A lover of nature, he left lands of shore and forest on Cape Cod as a sanctuary for birds.

SAMUEL W. ELLSWORTH

ANALES DE RADIOLOGIA

AMONG recent new journals is the "*Anales de Radiologia*," a quarterly publication, the property and the official organ of the Cuban Society of Radiology and Electrology. Three numbers have already appeared, the first bearing date of January, 1929.

The Editor is Dr. Alfredo G. Dominguez, who has the assistance of an Editorial Board consisting of Doctors Farinas, Rivero, Busquet, Viamonte and Gonzalez, respectively the President and the Executive Committee of the Cuban Radiological Society. The foreign collaborators include Hirsch of New York, George of Boston, Heuser of Buenos Aires and Case of Chicago. Annual subscription is $5.00; official address: Academia de Ciencias, Habana.

The opening page contains a greeting to all the scientific publications in the Cuban Republic as well as to radiological journals of the Americas and of Europe, a cordial sentiment heartily reciprocated by the *American Journal of Roentgenology and Radium Therapy*, and, we feel sure, by all its readers, singly and collectively.

The first issue presents excellent articles on "Ureterography" by Francisco H. Busquet; "Oxycephaly," by Filiberto Rivero; "Nonspecific Inflammatory Tumors of the Colon," by Manuel Viamonte, and "Primary Carcinoma of the Lung," by Pedro L. Farinas. All are adequately and well illustrated, and have appended excellent bibliographic lists.

The second number opens with a photograph of the "father" of radiology in Cuba, Professor Francisco Dominguez Roldan, founder of several of the important radiological departments in the hospitals of Havana, under whose supervision many of the now prominent Cuban radiologists began their work. Then follows another series of papers on important and timely radiological problems.

The third number memorializes the late Dr. Emilio Alamilla y Requeijo, formerly professor of physics in the Institute of Havana, who died while on a visit to the United States in 1924.

We compliment the Cuban Radiological Society on its enterprise and extend our best wishes for success.

JAMES T. CASE

SOCIETY PROCEEDINGS, CORRESPONDENCE AND NEWS ITEMS

Items for this column solicited promptly after the events to which they refer.

MEETINGS OF ROENTGEN SOCIETIES*

UNITED STATES OF AMERICA

AMERICAN ROENTGEN RAY SOCIETY
Secretary, Dr. John T. Murphy, 421 Michigan St., Toledo, Ohio.
Thirty-first annual meeting: West Baden, Indiana, Sept. 23–26, 1930.

AMERICAN COLLEGE OF RADIOLOGY
Secretary, Dr. Albert Soiland, 1407 S. Hope St., Los Angeles, Calif.
Annual Meeting, Detroit, Mich., 1930.

SECTION ON RADIOLOGY, AMERICAN MEDICAL ASSOCIATION
Secretary, Dr. G. W. Grier, Jenkins Arcade, Pittsburgh, Pa.
Annual meeting, Detroit, Mich., June 23–27, 1930.

RADIOLOGICAL SOCIETY OF NORTH AMERICA
Secretary, Dr. I. S. Trostler, 812 Marshall Field Annex, Chicago, Ill.
Sixteenth annual session: 1930, to be announced.

RADIOLOGICAL SECTION, LOS ANGELES COUNTY MEDICAL SOCIETY
Secretary, Dr. Lowell S. Goin, Wilshire Medical Building, Los Angeles.
Meets on the third Wednesday of each month at the California Hospital.

RADIOLOGICAL SECTION, SOUTHERN MEDICAL ASSOCIATION
Secretary, Dr. W. S. Lawrence, Medical Arts Bldg., Memphis, Tenn.

BUFFALO RADIOLOGICAL SOCIETY
Secretary-Treasurer, Dr. Joseph S. Gian-Franceschi, 610 Niagara St.
Meets second Monday of each month except during the summer months, the place of meeting to be selected by the host.

CHICAGO ROENTGEN SOCIETY
Secretary, Dr. W. T. Bronson, Englewood Hospital.
Meets monthly on second Thursday from October to May (except during month of December) at Virginia Hotel. Dinner at 6 P.M., scientific session at 8 P.M.

CLEVELAND RADIOLOGICAL SOCIETY
Secretary, Dr. Harry L. Farmer, 2930 Prospect Ave.
Meetings are held at 6 o'clock at the University Club on the fourth Monday evening of each month from September to April, inclusive.

DETROIT ROENTGEN RAY AND RADIUM SOCIETY
Secretary, Dr. O. J. Shore, Fisher Building.
Meets monthly on second Friday from October to May, at Wayne County Medical Society Building.

CENTRAL ILLINOIS RADIOLOGICAL SOCIETY
Secretary, Dr. H. C. Kariher, Decatur, Illinois.
Regular meetings held quarterly.

INDIANA ROENTGEN SOCIETY
Secretary, Dr. J. N. Collins, Indianapolis, Ind.
Annual meeting each February 22 in Indianapolis.

MILWAUKEE ROENTGEN RAY SOCIETY
Secretary, Dr. J. E. Habbe, 221 Wisconsin Ave., Milwaukee.
Meets first Friday in October, December, February and April.
Place of meeting designated by the president.

NEW ENGLAND ROENTGEN RAY SOCIETY
Secretary, Dr. Thomas R. Healy, 370 Marlboro St., Boston, Mass.
Meets monthly on third Friday, Boston Medical Library.

NEW YORK ROENTGEN SOCIETY
Secretary, Dr. E. Everett Rowell, 200 West 59th St.
Meets monthly on third Monday, New York Academy of Medicine.

CENTRAL NEW YORK ROENTGEN RAY SOCIETY
Secretary, Dr. D. S. Childs, 316 Gurney Bldg., Syracuse, N. Y. Three meetings a year—April, August and November.

PACIFIC COAST ROENTGEN RAY SOCIETY
Secretary, Dr. Harold B. Thompson, Seattle, Wash.
Two meetings a year.

PENNSYLVANIA RADIOLOGICAL SOCIETY
Secretary, Dr. W. E. Reiley, Clearfield, Penna.
Two meetings a year, April and October.

PHILADELPHIA ROENTGEN RAY SOCIETY
Secretary Dr. John T. Farrell, Jr., 235 S. 15th St., Philadelphia.
Meets monthly on first Thursday evening, Pennsylvania Hospital.

* Secretaries of societies not here listed are requested to send the necessary information to the Editor.

ROCHESTER ROENTGEN RAY SOCIETY, ROCHESTER, N. Y.
Secretary, Dr. James M. Flynn, 282 Alexander St.
Meets monthly on the first Friday evening at 7:45 at the Rochester Medical Association Building.

ST. LOUIS ROENTGEN CLUB
Secretary-Treasurer, Dr. L. R. Sante, Missouri Building
Meets first week of each month. Time and place of meetings designated by president.

TEXAS RADIOLOGICAL SOCIETY
Secretary-Treasurer, Dr. C. P. Harris, Houston, Texas.
Meets annually one day preceding the meeting of the Texas State Medical Association.

UNIVERSITY OF MICHIGAN ROENTGEN RAY SOCIETY
Secretary, Dr. D. M. Clark, University Hospital, Ann Arbor, Mich.
Meets every Wednesday evening from September to July, at 7:30 o'clock in the amphitheatre of the University Hospital.

VIRGINIA ROENTGEN RAY CLUB
Secretary, Dr. Wright Clarkson, 205 S. Sycamore St., Petersburg, Va.

British Empire

BRITISH INSTITUTE OF RADIOLOGY INCORPORATED WITH THE RÖNTGEN SOCIETY
Director, Dr. John Muir, 32 Welbeck St., London W. 1.
Meets on the third Thursday of each month, from November to June inclusive, at 8:15 P.M., at 32 Welbeck St., London, W. 1., or as advertised.

ELECTRO-THERAPEUTIC SECTION OF THE ROYAL SOCIETY OF MEDICINE (CONFINED TO MEDICAL MEMBERS)
Meets on the third Friday of each month during the winter at 8:30 P.M. at the Royal Society of Medicine, 1 Wimpole St., London, W. 1.

SECTION OF RADIOLOGY AND MEDICAL ELECTRICITY, AUSTRALASIAN MEDICAL CONGRESS
Secretary, Dr. H. M. Cutler, 139 Macquarie St., Sydney, New South Wales.

RADIOLOGICAL SECTION OF THE VICTORIAN BRANCH OF THE BRITISH MEDICAL ASSOCIATION
Secretary, Dr. Colin Macdonald, Lister House, 61 Collins St., Melbourne, Australia.
Meets monthly at Melbourne during the winter.

SECTION ON RADIOLOGY, CANADIAN MEDICAL ASSOCIATION
Secretary, Dr. A. H. Rolph, 160 St. George St., Toronto, Ont.

RADIOLOGICAL SECTION, NEW ZEALAND BRITISH MEDICAL ASSOCIATION
Secretary, Dr. P. C. Fenwick, The Hospital, Christ-church.
Meets annually.

Continental Europe

BELGIAN SOCIETY OF ROENTGENOLOGY
Secretary, Dr. J. Boine, Avenue des Alliés, 134, Louvain (Belgium).
Meets monthly on second Sunday at d'Egmonds Palace, Brussels, except in the summertime.

SOCIETE DE RADIOLOGIE MÉDICALE DE FRANCE
Meets monthly on second Tuesday, except during months of August and September, 12 Rue de Seine, Paris.

SOCIÉTÉ SUISSE DE RADIOLOGIE (SCHWEIZERISCHE RÖNTGEN-GESELLSCHAFT)
Secretary for French language, Dr. A. Grosjean, La Chaux de Fonds.
Secretary for German language, Dr. Scheurer, Molzgasse, Biel.
Meets annually in different cities.

SOCIÉTÉ FRANCAISE D'ELECTROTHÉRAPIE ET DE RADIOLOGIE MÉDICALE
Meets monthly on fourth Tuesday, except during months of August and September, 12 Rue de Seine, Paris.

ASSOCIATION OF GERMAN ROENTGENOLOGISTS AND RADIOLOGISTS IN CZECHO-SLOVAKIA
Secretary, Dr. Walter Altschul, German University, Prague, II/52.

DEUTSCHE RÖNTGEN-GESELLSCHAFT (GESELLSCHAFT FÜR RONTGENKUNDE UND STRAHLENFORSCHUNG)
Meets annually in April, alternating one year in Berlin, one year in some other German city. Meets in addition every two years with the Gesellschaft deutscher Naturforscher und Aerzte.
Permanent secretary, Professor Dr. Haenisch, Klopstockstrasse 10, Hamburg, Germany.

SUD- UND WESTDEUTSCHE RÖNTGENGESELLSCHAFT
Meets annually in different cities.

NORD- UND OSTDEUTSCHE RÖENTGENGESELLSCHAFT
Meets annually in different cities.

DUTCH SOCIETY OF ELECTROLOGY AND ROENTGENOLOGY
Holds two meetings a year in Amsterdam, one in the Spring, and one in the Fall.

SOCIETA ITALIANA RADIOLOGIA MEDICA
Secretary, Professor M. Ponzio, University of Turin, Turin.

SOCIETATEA ROMANA DE RADIOLOGIE SI ELECTROLOGIE
Secretary, Dr. Nicolae Busila, 44 Elizabeta Blvd., Bucarest.
Meets second Monday in every month with the exception of July and August.

ALL-RUSSIAN ROENTGEN RAY ASSOCIATION, LENINGRAD, USSR in the State Institute of Roentgenology and Radiology, 6 Roentgen St.
Secretaries, Drs. S. A. Reinberg and S. G. Simonson.
Meets annually.

LENINGRAD ROENTGEN RAY SOCIETY
Secretaries, Drs. S. G. Simonson and G. A. Gusterin.
Meets monthly on the first Monday at 8 o'clock in the State Institute of Roentgenology and Radiology, Leningrad.

MOSCOW ROENTGEN RAY SOCIETY
Secretaries, Drs. L. L. Holst, A. W. Ssamygin and S. T. Konobejevsky.
Meets monthly on the first Monday at 8 o'clock, the place of meeting being selected by the Society.

POLISH SOCIETY OF RADIOLOGY
Secretary, Dr. A. Elektorowicz, 19 Hoza St., Warsaw.
Meets annually.

WARSAW SECTION, POLISH SOCIETY OF RADIOLOGY
Secretary, Dr. B. Krynski, 11 Zielna St.
Meets once a month except in the summertime.

SCANDINAVIAN ROENTGEN SOCIETIES
The Scandinavian roentgen societies have formed a joint association called the Northern Association for Medical Radiology, meeting every second year in the different countries belonging to the Association. Each of the following societies, with the exception of the Denmark Society, meets every second month except in the summertime:

SOCIETY OF MEDICAL RADIOLOGY OF SWEDEN
Meets in Stockholm.

SOCIETY OF MEDICAL RADIOLOGY IN NORWAY
Meets in Oslo.

SOCIETY OF MEDICAL RADIOLOGY IN DENMARK
Secretary, Dr. O. Wissing, Copenhagen.
Meets on the second Wednesday of each month from October to July in Copenhagen, at 8 o'clock in the State Institute of Roentgenology.

SOCIETY OF MEDICAL RADIOLOGY IN FINLAND
Meets in Helsingfors.

VIENNA SOCIETY OF ROENTGENOLOGY
Secretary, Professor Holzknecht, Vienna, IX, General Hospital.
Meets on the first Tuesday of each month from October to July.

REPORT OF THE COMMITTEE ON SAFETY AND STANDARDS

The Committee on Safety and Standards recommends the use of films of cellulose acetate in place of films of cellulose nitrate in all roentgen-ray laboratories, both public and private.

The reasons for this recommendation are: first, the ignition point of cellulose acetate is much higher than the ignition point of cellulose nitrate; second, the combustion of cellulose acetate does not release nitrogen-containing gases of high toxicity as occurs in the combustion of cellulose nitrate, and third, that the combustion of cellulose acetate is smothered by lack of oxygen while the combustion of cellulose nitrate can go on in the absence of oxygen.

The Committee further recommends that the American Roentgen Ray Society in executive session request its members to use *cellulose acetate* films exclusively and as soon as possible. (This recommendation was put in the form of a resolution which was passed.)

The Committee recommends that in the storage of exposed cellulose nitrate films the recommendations of the National Board of Underwriters be rigidly followed, and that a copy of their recommendations be embodied in the printing of this report.

It is further advised that the recommendations of this Committee be published in the *American Journal of Roentgenology and Radium Therapy*.

The Committee would call attention to the danger of high tension shock from leakage of water from water-cooled tubes particularly in therapy. The Committee recommends the careful study of the article by Lauriston Taylor of the U. S. Bureau of Standards on "Roentgen-Ray Protection" published in the *American Journal of Roentgenology and Radium Therapy*, July, 1929.

The Committee believes that the roentgen ray as a therapeutic agent is dangerous when improperly administered and should never be used therapeutically except under

the direct supervision of an experienced medical radiologist.

The Committee therefore asks your executive endorsement of this important fact and that this endorsement be given proper publicity. (This was put in the form of a resolution which was passed.)

The Committee recommends that the American Roentgen Ray Society endorse the recommendations of the International X-ray Unit Committee and recommends the adoption of the International unit—r. (This recommendation was put in the form of a resolution which was passed.)

P. M. Hickey, *Chairman*
H. K. Pancoast
W. D. Coolidge
A. U. Desjardins
H. J. Ullmann
B. H. Nichols
G. E. Richards
R. R. Newell

REGULATIONS FOR THE STORAGE AND HANDLING OF PHOTOGRAPHIC AND X-RAY NITRO-CELLULOSE FILMS*†

Note: Film of slow burning or safety base (acetate-cellulose) does not have the fire hazard characteristic of nitro-cellulose film and therefore these regulations do not apply where safety film only is used. Where both kinds of film are used or stored, care must be taken to see that suitable storage and protective requirements are complied with for the nitro-cellulose film.

1. General Storage of Unexposed Films.

11. Stores, Warehouses and Wholesale Storage.

(a) When unexposed film in shipping containers, including suitable cartons, exceeds in the aggregate 500 cubic feet, the room shall be protected by automatic sprinklers.

(b) Where shelving used for storage of individual packages exceeds 250 cubic feet in capacity the room shall be equipped with automatic sprinklers.

(c) Storage not in shipping containers in any fire section equipped with automatic sprinklers may be permitted up to an aggregate of 1000 cubic feet. Where the aggregate not in shipping containers exceeds 1000 cubic feet, storage shall be in a vented storage room. See Section 25.

* The word "shall" is used herein to indicate requirements; the word "should" is intended to indicate recommendations or that which is advised but not required.

† Regulations of the National Board of Underwriters, as recommended by the National Fire Protection Association, edition of 1925.

12. Portrait and Commercial Studios (Including Doctors' Offices).

Storage of unexposed films shall be in cabinets or filing drawers (ordinary wooden or metal filing cases permitted) or on shelves located at least two feet above the floor. Where storage exceeds 250 cubic feet, the room shall be equipped with automatic sprinklers.

13. Hospitals and Similar Institutions.

Storage of unexposed films shall be in metal boxes or cans (constructed of lead or lead lined if desired) on shelves two feet above the floor, or in approved double walled cabinets vented to the outside air.

2. Storage of Film Negatives.

(The following paragraphs apply only to film negatives (developed film); for unexposed films paragraphs 11 to 13 apply.)

21. General.

Film negatives in storage or in process of handling shall be kept in heavy manila envelopes or in cardboard boxes, not exceeding six films to an envelope or 25 to a box.

22. Portrait and Commercial Studios.

Film negatives up to 200 pounds may be kept in wooden or metal filing cases or on shelves; but if exceeding 100 pounds, separation shall be provided by storing in different rooms or on separate sides of the same room. Where the film stored exceeds 200 pounds, vented cabinets or vented storage rooms shall be provided. Not more than 1,000 pounds shall be stored in cabinets in any one studio, nor more than 500 pounds in any one cabinet.

Note: The following table may be used as a guide in computing the weight of film:

No. of Negatives	Size	Approximate Weight
1000	14x17 in.	118 lbs.
1000	10x12 in.	60 lbs.
1000	8x10 in.	40 lbs.

(Other sizes in proportion to area.)

23. Hospitals and Similar Institutions.

All film shall be kept in vented cabinets or in a vented storage room.

24. Vented Cabinets.

(a) No cabinet shall exceed 30 cubic feet capacity.

(b) Cabinets shall be of approved insulated construction.

(c) Cabinets having a capacity in excess of 200 pounds of film shall be divided into at least

two distinct compartments; each compartment provided with an independent door and vent. The separating partitions should be practically air tight and be of substantial construction equivalent to the sides.

(d) Cabinets holding over 100 pounds of film shall be equipped with at least one automatic sprinkler in each compartment unless each compartment holds less than 30 pounds of film, and the construction is such that fire will not extend from one compartment to another.

(e) Each compartment shall be provided with a vent to the outside. The vent shall have a cross sectional area of at least one square inch per cubic foot of capacity of the cabinet.

25. Vented Storage Rooms.

(a) Walls or partitions, floors and ceilings shall be of non-combustible material. Walls shall be continuous from floor to ceiling and shall be securely anchored. The following constructions have been found suitable. Others shown furnishing equivalent performance will be equally acceptable.

(1) Reinforced concrete.
(2) Metal lath with solid cement plaster not less than 2½ inches thick.
(3) Three-quarters of an inch of cement or gypsum plaster on metal lath on each side of studs.
(4) Brick.
(5) Tile.
(6) Hollow concrete blocks.

} Plastered on each side to a thickness of ¼ inch.

(b) Openings from the storage room to other parts of the building shall be protected by a fire door conforming as to construction and installation to Class B of the Regulations for the Protection of Openings in Walls and Partitions Against Fire. The door shall be of the swinging type and close into a rabbet, or otherwise be made tight to prevent passage of flame around edges; it shall be self-closing, and if fastened open shall be arranged to close automatically in case of fire originating inside or outside of the storage room.

(c) No skylights shall be permitted.

(d) Slatted shelves shall be divided vertically at intervals not exceeding 10 feet. Backs and divisions shall be preferably of incombustible material, or of ⅞-inch tongued and grooved boards or their equivalent in resistance to heat and gases. Slats shall be not over 4 inches wide and spaced at least one inch apart. Aisle space shall be at least 3 feet wide. Height of racks shall be not over 8 feet and in no case shall stock be stored higher than 2 feet below sprinkler deflectors.

(e) Each storage room shall be equipped with automatic sprinklers, arranged according to the Sprinkler Regulations in so far as applicable. A sprinkler head shall be installed in the center of the aisle opposite each section. The area to be covered by each sprinkler head shall not exceed 64 square feet of floor area. Proper baffles shall be provided between heads where closely spaced.

NOTE: A room so located on the roof as not to endanger other parts of the building requires automatic sprinklers only when salvage of the contents is desired or where there is probability of panic from the fumes.

(f) An adequate vent to the outer air shall be provided. The area of vent shall be equal to a clear opening of at least ½ square inch per cubic foot of room. Such vent may be provided by installing approved heat releasing devices on the windows, preferably on the upper sash, arranged to open windows automatically in case of fire.

(g) Heating should preferably be by hot water. Where steam heating is used, only low pressure steam shall be permitted; radiators or coils shall be on ceiling or shall be adequately screened, and pipe lines shall be protected and screened.

3. GENERAL.

(Applies to both unexposed films and film negatives.)

31. (a) All wiring and equipment shall conform to the National Electrical Code.

(b) Only incandescent electric lights shall be permitted. In storage rooms these shall be protected with either substantial wire guards or vapor-proof globes, or both.

(c) The use of portable lights on extension cords in any storage room is prohibited.

(d) Illuminators shall be so built that the diffusing glass does not become overheated. There shall be no unnecessary display of negatives in lighted illuminators.

32. Smoking shall be prohibited in rooms where film is stored or in developing or similar work rooms. Conspicuous "No Smoking" signs shall be posted in prominent places.

33. No film shall be stored within 2 feet of

steam pipes, radiators, chimneys, or other source of heat.

34. First aid fire appliances suitable for extinguishing "Class A fires" (fires in ordinary combustible material) shall be provided for protection of rooms containing film. (See Regulations on First Aid Fire Appliances.)

35. Discarded film shall be stored and handled in the same manner as other film until removed from the premises.

REPORT ON THE RECENT FIRE AT THE UNIVERSITY OF CALIFORNIA HOSPITAL

To the Editor:

Perhaps a few details about our recent fire at the University of California Hospital may be of interest. The laboratory is on the eastern end of the third floor in the front of the building. The wards and patients' rooms are on the fourth and fifth floors, and the western end of the third. The fire started in the viewing room, at 4:30 A. M. Monday, from an overheated illuminating box, which may have had a fim upon it. The box had been lighted about twenty hours. The room contained about five hundred pounds (thirty running feet) of nitrocellulose films in paper envelopes on wooden shelves, surmounted by wooden illuminators. This room is about 15×20 feet, with three large windows opening on to the street. It has only one door which closes toward the hall, and this door was locked. Above the door was a plain glass transom, one foot high. There were no other openings into the room, except a small duct connected with the ventilating system of the hospital. The telephone switch-board is directly across the hall from this room and the operator on duty first heard a crackling sound, described as water running over pebbles, in the viewing room. When she opened her door to investigate, the hall was filled with smoke. Within a few moments flames appeared at the top and bottom of the door of the telephone room and the operator was compelled to jump two floors to a lawn behind the hospital. She states that she heard no explosion. One of the first persons she called was the comptroller of the hospital, who lives close by. He looked up to see a sheet of flame arising two floors above the x-ray windows. By effective work of the nursing and house staff all the patients were evacuated within twenty-four minutes to a hill behind the hospital, and within forty-five minutes the fire was practically over. Three firemen were slightly gassed and several nurses were put to bed for twenty-four hours, but no more than temporary discomfort is apparent in any of these cases. No patients were affected

In surveying the wreck, one could not fail to be impressed by the relatively severe damage produced by the flames which came through the transom above the door. If this opening had not been present no damage would have been done to the interior of the hospital. As it was flames spread seventy-five feet in each direction from the transom, until they were stopped respectively by the end of the hall and a wire glass partition with swinging doors, which separated the eastern and western portions of the third floor. Within this area the ceiling and the upper portion of the walls looked as though they had been subjected to a gigantic torch, and at the ends of the damaged area a considerable amount of heavy brown deposit of nitrite was evident upon the walls. The room itself was gutted and the rapidity with which the fire burned was evidenced by the fact that a pile of filing envelopes and a box of candy upon the secretary's desk were only barely scorched. The wooden furniture was charred but not destroyed

The obvious conclusion from this experience, as well as the previous ones, is that any room containing a film file should be isolated from the remainder of the building by solid walls. A self-closing door, which closes toward the building, should be the only break in the walls. If it can be made gas tight by metal weather strips so much

the better. Certainly the room should have no connection to the general ventilating system. It should be provided with large windows of thin glass, to act as safety valves, opening on to a vacant space. Any windows above them should be equipped with wire glass. Metal illuminators and film files should complete the equipment. A room thus equipped, in a fireproof building, will be safe.

The pamphlet published by the Chemical Warfare Service on the Disaster at the Cleveland Clinic should be read carefully by every roentgenologist. The following conclusions from this pamphlet are worth repetition:

"Owing to the sensitiveness of all nitrocellulose products to heat, films should be stored in a cool, dry, fireproof room. Lighting should be by overhead bowl lights and should be sufficient to light the entire room. No sockets should be provided for extension cords. If it is necessary to install heat it should be by hot water or low-pressure steam. The radiator should be located in a portion of the room entirely free from film storage and should be fully protected by guards and the pipes should enter the room at the point occupied by the radiator.

"Owing to the large volumes of poisonous gases generated in film fires, film storage rooms should be so located that gases generated in them could not be disseminated to other parts of a large building. They should be provided with sufficient exits so that any gases generated would have ready access to the open air. This may be effected by the use of over-balanced vents that are self-opening and actuated by thermal control releasing means. Efficient and tight-fitting fire doors should be provided.

"Owing to the sensitiveness of nitrocellulose products to reaction with other substances the film storage room should be reserved for the storage of films only. No other material should be allowed to come into contact with the films. It is self-evident that the exclusion of oily or greasy rags, mops, clothing, etc., from a film storage room should be rigidly enforced since these materials frequently cause fires by spontaneous ignition.

"Owing to the exothermic nature of the decomposition reaction in film fires, provision should be made for rapidly cooling down the entire room in case a fire starts. This may be done by a multiple unit sprinkling system which delivers a large volume of water. Copious volumes of water from overhead sprinklers serve at least two useful purposes. One of these is that the gases from the burning films are kept cooled down, their volume is reduced, and the danger of explosion is minimized. Another is that the poisonous brown oxides of nitrogen are soluble in water and are removed from the gases of combustion by the water. It has been demonstrated by the Eastman Kodak Co. that many film fires are actually extinguished by an efficient sprinkler system which gets into action early. In all cases the loss and damage were greatly reduced by the use of sprinklers."

HOWARD E. RUGGLES.

San Francisco, Calif.
November 22, 1929.

Vol. XXIII, No. 1

DEPARTMENT OF TECHNIQUE

Department Editor: David R. Bowen, M.D., Pennsylvania Hospital, Philadelphia, Pa.

A COMBINED ROENTGENOSCOPIC AND ROENTGENOGRAPHIC CYSTOSCOPIC TABLE

By David R. Bowen, M.D., *and* Leon Herman, M.D.
Pennsylvania Hospital
PHILADELPHIA, PENNSYLVANIA

THE advantages of pyeloscopy as advocated by Manges, Legueu and others, have long been admitted both by roentgenologists and urologists, but technical difficulties in the application of the method have tended to discourage its general use. Manges, at the Jefferson Hospital, has, for the past seventeen years, roentgenoscopically controlled all pyelographic studies. This has been done without special equipment. Routinely the patient is catheterized in one of the operating rooms and is then moved to the roentgen-ray department where the pyelographic medium is injected. In spite of this inconvenience, his enthusiasm for the method has not waned and has passed on to us. After several attempts we were finally deterred by the inconvenience and we have not used the method since 1919. Nevertheless, we have kept the idea in the mind of producing a practical table combining in a desirable way both roentgenoscopy and cystoscopy. Correspondence with manufacturers has accumulated, some of which appeared to be final, and each new appeal to action has ended in inaction.

During the past year the matter was taken up with Mr. Frank R. Eltinge of the American Vacuum Company, and upon his assurance that the technical difficulties could be overcome, it was decided to proceed with the work which has resulted in the production of the model here presented.

A careful study of all of the existing pyelographic tables led to the conclusion that the construction of the Young table permitted the desired modification, thus eliminating the necessity of developing an independent design. The modified table serves the needs of the cystoscopist without disregarding the needs of the roentgenologist in matters of convenience or efficient working conditions.

The essential modifications comprise:

(*a*) The provision of a movable roentgenoscopic unit so attached to the table that it can be moved both horizontally and laterally. It seems to be wholly necessary that this unit be of the oil immersed, shock proof type, with no high voltage possible at any outside point. We believe that the problem could not be solved if such units were not available.

(*b*) An excursion range of the Potter-Bucky diaphragm sufficient to permit both roentgenoscopy and stereoscopic roentgenography.

(*c*) The provision for drainage without interference with the roentgenoscopic manipulations.

(*d*) The provision of all of these features without interfering with cystoscopic uses of the table.

The modifications made in the original model that would permit the foregoing provisions follow:

The gear boxes for Trendelenburg and upright positions were placed considerably farther back toward the patient's head. An earlier plan was to drop the gear shaft to a point near the floor, connecting either end to the gears by link belts. It was later found simpler to place the gears farther up and to first lengthen the milled gear rods and then attach them to the table 6 1/2 inches nearer the head. In this manner all interference between the gear shaft and the oil immersed roentgenoscopic unit was avoided. The range of excursion from the

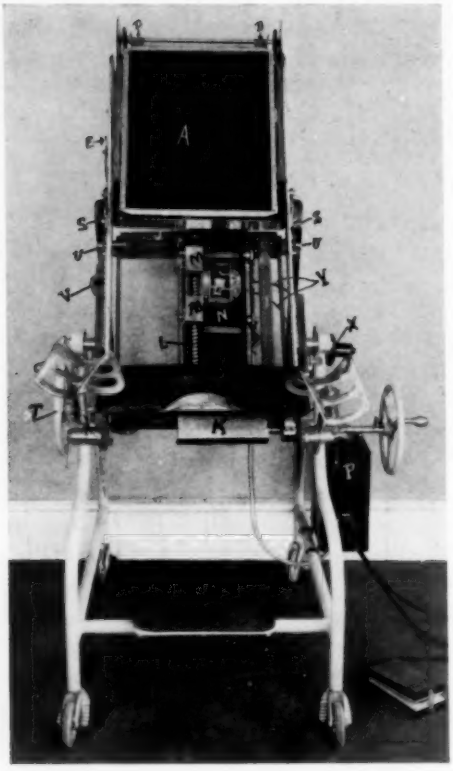


FIG. 1. Table elevated and bakelite top removed, showing "shock proof" oil immersed tube unit with worm gear movement. Potter-Bucky diaphragm is in position under patient's head, leaving lower field free for roentgenoscopy.

Trendelenburg to the upright position is unimpaired.

It was necessary to discard the entire drip pan system and substitute an expansible funnel with a tube leading to an open pail on the floor. Two designs have been considered and it is not yet certain which may finally prove to be more acceptable.

It was necessary also to discard the back rest (an accessory). A detachable model can be substituted.

It was necessary to replace the round head screws of the Potter-Bucky diaphragm with flat head screws in order to reduce the outside width.

The underneath bracing frame at the table head was removed and in its place a straight section of angle-iron was substituted. This permits an excursion of the Pot-

KEY TO ILLUSTRATIONS

The same numeral is used to designate a given part in each illustration which shows that part.

Potter-Bucky Diaphragm

A. Potter-Bucky diaphragm in high position. Roentgenoscopic field below is free (Figs. 1 and 2).

B. Potter-Bucky diaphragm in position for roentgenograms (Fig. 3).

C. Potter-Bucky diaphragm dial, exposure time (Figs. 2 and 3).

D. Guides for loading cassettes. Easily reached in any position (Fig. 1).

E. Spring catch releases lever; holds Potter-Bucky diaphragm in either position (Fig. 1).

F. Track on which Potter-Bucky diaphragm moves (Figs. 2 and 3).

G. Rollers running on F (Figs. 2 and 3).

Oil Immersed Roentgenoscopic Unit

H. Wheel and shaft governing all movements of roentgenoscopic unit (Figs. 1, 2 and 3).

I. Track for lengthwise movements of rollers of roentgenoscopic unit (Fig. 1).

J. Track for crosswise movements of rollers of roentgenoscopic unit (Fig. 1).

K. Housing of bevel gear which transmits motion to worm gear (Fig. 1).

L. Worm gear screws (Figs. 1 and 2).

M. Worm gear boxes, grease packed (Figs. 1 and 2).

N. Roentgenoscopic unit transformers and tube included. Voltage limited to 110 (Figs. 1, 2 and 3).

O. Current control (Figs. 2 and 3).

P. Control box (Figs. 1, 2 and 3).

Table Movements

Q. Wheel and shaft operating gear for table elevation (Figs. 2 and 3).

R. Gear boxes for table elevation (Figs. 2 and 3).

S. Gear rods for table elevation (Figs. 1, 2 and 3).

T. Wheel for movement of seat (Figs. 1, 2 and 3).

U. Clamps for compression of band (Figs. 1, 2 and 3).

V. Socket for tube holder (Figs. 1, 2 and 3).

W. Angle iron, replacing all other frame bracing at table head. Also serves as stop for accessory back rest, if used (Fig. 3).

X. Shutter control, fixed position (Fig. 1).

Y. Boden cables conveying control to shutters (Figs. 1, 2 and 3).

Z. Shutters (Figs. 1, 2 and 3).

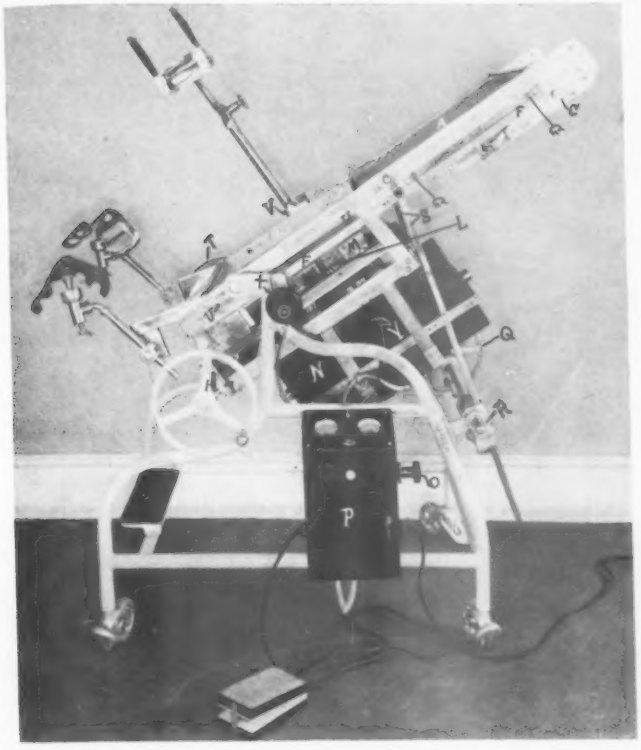


Fig. 2. Table partly elevated; bakelite top removed, Potter-Bucky diaphragm in high position, side view from roentgenologist's position.

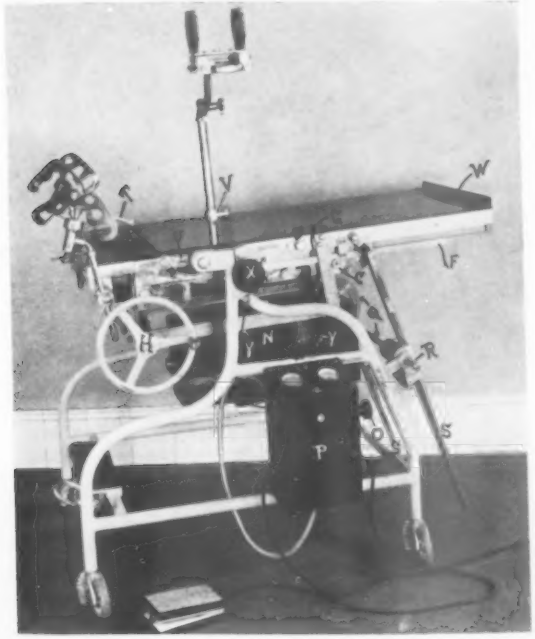


Fig. 3. Same aspect as Figure 2; bakelite top in place. Potter-Bucky diaphragm in low position for roentgenography.

ter-Bucky diaphragm for the entire length of the table. The diaphragm being fitted with four side rollers, can be pulled upward, entirely out the roentgenoscopic field. In either position it is held by a spring catch.

The lever for winding the spring motor of the diaphragm was entirely replaced. It now moves in a horizontal rather than vertical plane.

In these six changes no cystoscopic convenience has been sacrificed unless it is the separate back rest. We have found the back rest to be an unused appendage. These changes having been made, it remained to arrange a hanger and track for the oil immersed unit. This would have been simple had we been content to roentgenoscope only in the horizontal position.

To be adaptable to all positions it was necessary to actuate the tank lengthwise of the table with a worm gear. Considerable difficulty was encountered in this but finally a specially turned gear was evolved which performs the entire excursion with 3 1/2 turns of the control wheel. This same wheel, and its shaft, form the handle for manual movement of the tank crosswise of the table.

The shutters are connected by Boden cables to the original shutter control, which is in a fixed position near the tank movement control. The control stand is also near the right hand. The cystoscopic table controls are all on the operator's (cystoscopist's) left hand side of the table and all roentgenoscopic controls are on the opposite side. The roentgenoscopic unit has a limit of 5 inches and 10 ma., while the overhead tube, Potter-Bucky exposure, may be supplied with any chosen power conveyed by an overhead line. A film may be in readiness in the diaphragm carriage and instantly shifted into place and a proper diaphragm exposure made, rather than the always more or less make-shift expo-

sure possible with the underneath roentgenoscopic set-up. It has not been considered necessary, or even desirable, to counterbalance the Potter-Bucky diaphragm. This could be useful only when roentgenoscoping with patient upright, 15° or more above horizontal. In this position the diaphragm is easily lowered with cassette No. 1 in place, and it is not necessary to re-elevate the diaphragm as cassette No. 2 is placed more easily with the diaphragm low. In table positions lower than this it is easier to move the diaphragm to the high position for re-loading. In fact, it is much easier to do this than to reach up and under as is necessary in the unmodified table.*

*The writers cordially acknowledge the cooperation of Dr. Paul A. Bishop. Dr. Manges has made important suggestions from time to time as the work proceeded. Appreciation is also due Andrew Diedrich and William R. Jameison, of the American Vacuum Company, who helped to solve many troublesome mechanical problems.

BOOK REVIEWS

Books Received Are Acknowledged under Heading: Books Received. This must be regarded as a sufficient return for the courtesy of the sender. Selections will be made for review in the interests of our readers and as space permits.

Osteomyelitis and Compound Fractures and Other Infected Wounds: Treatment by the Method of Drainage and Rest. By H. Winnett Orr, M.D., F.A.C.S., Chief Surgeon of the Nebraska Orthopedic Hospital, Orthopedic Surgeon Lincoln General Hospital, Consulting Orthopedic Surgeon Bryan Memorial Hospital, Lincoln, Nebraska. Cloth. Price, $5.00. Pp. 208, with 54 illustrations. St. Louis: The C. V. Mosby Co., 1929.

Dr. Orr has written a book which must be intensely interesting to all surgeons. He has emphasized the importance of "surgical rest" in infected wounds with a vigor which must impress all readers. As he himself says, no new principles are set forth in his work, but he has chosen the best of the teachings from Hunter's and Lister's days to the present time, and made from them a system of treatment, which he justly calls the "Orr Method." The "method" consists essentially in thorough surgical opening of all infected areas, in osteomyelitis, acute or chronic, in compound fractures, and in wounds of the soft parts, followed by wide open packing with vaseline or vaseline gauze, and then fixation in plaster of Paris dressings, so arranged that no motion is possible in the infected part. So far, all surgeons of experience can agree with the principles of adequate drainage followed by rest. This much has been taught by the most capable and experienced surgeons the world over.

It is only when Dr. Orr maintains that this method must be followed by complete wound neglect, inside of the plaster dressing, for long periods of time, that he runs foul of tradition. In so doing, he casts overboard all the established ideas as to wound dressing. The Carrel-Dakin method is thrown into the discard along with all other methods of wound cleansing, many of which have been of value to many surgeons. Dr. Ridlon says in the introduction to the book that he would be glad to have Dr. Carrel treat osteomyelitis by the Carrel-Dakin technique but that he would prefer to have any ordinary surgeon treat it by the "Orr Method."

It is certain that the elimination of frequent dressings inherent in the "Orr Method" is conducive to the patient's comfort. Painful dressings are eliminated. The well advertised odor of patients so treated is really of minor importance, and can be handled, even in a large ward, through the use of electric fans.

We have then to consider a method of infected wound treatment which violates many accepted surgical principles, but apparently goes back to fundamentals—a method which has been successful in many hands, including the present reviewer's, but which has not been sufficiently proved to be accepted as routine.

Many more surgeons must use the method with the "orthopedic viewpoint" in mind, before it can be finally accepted. Dr. Orr must give us a much larger number of carefully recorded successful cases, before we can accept the method without reservation. Meanwhile the method saves pain to the patient, trouble to the surgeon and should be widely tried.

The book is very readable and the early chapters on Listerian and war surgery vividly recall the present neglect of previous worthwhile surgical lessons.

Frederick C. Kidner.

Die photographischen Grundlagen des Röntgenbildes. By Dr. Richard Herz, Frankfurt a. M. Paper, price 17.00 M.; bound, price 19.00 M. Pp. 225, with 154 illustrations. Leipzig: Georg Thieme, 1929.

The title of this book, which may be translated literally as "The Photographic Fundamentals of Roentgen Pictures," is misleading. Its scope is much broader than is implied by these English words. It begins with a mathematical discussion of "Blackening, Contrast and Definition," includes roentgen-ray electricity, tubes, the physics of roentgen rays, light-sensitive emulsions, dark room processes, all phases of practical technical work and ends with a chapter on the skin doses given in roentgenography and roentgenoscopy. Therefore, a more descriptive title in English should read something like this, "The Physical and Technical Elements of Roentgenology."

The book is divided into a "Theoretical" and a "Practical" part. In the former is treated what might broadly be termed the physics of roentgenology. The author goes into this more thoroughly and extensively than is usual in books intended for medical men. He makes frequent use of mathematical formulae, graphs and tables. While the reviewer is not qualified to discuss its accuracy from the standpoint of mathematics and physics, he feels that much useful information has been graphically presented.

The "Practical" part of the book was intended by the author to be a complete compendium of instruction in roentgen technique, to be used independently of the "Theoretical" part, if desired. There is, therefore, a certain amount of overlapping. The manipulation of roentgen apparatus, tubes, the Potter-Bucky diaphragm, intensifying screens, dark room construction and technique, exposure technique and film defects are among the subjects discussed. There is even a chapter on roentgen-cinematography.

As with most German books it is well done from the publishers standpoint, and the illustrations are good.

It impresses the reviewer as a good compendium of technical information though doubtless some technical procedures recommended therein in will not be accepted as the best by all readers.

ROSS GOLDEN.

BOOKS RECEIVED

MASTOIDS ROENTGENOLOGICALLY CONSIDERED. (Annals of Roentgenology, Volume I.) By Frederick M. Law, M. D., Roentgenologist, Manhattan Eye, Ear, Nose and Throat Hospital, New York. Second edition revised. Cloth. Price, $12.00. Pp. 42, with 35 plates and 12 text illustrations. New York: Paul B. Hoever, Inc., 1929.

GRENZ RAY THERAPY. By Gustav Bucky, M. D., New York. With contributions by Otto Glasser, Cleveland, and Dr. Olga Becker-Manheimer, Hamburg. Cloth. Price, $3.50. Pp. 170, with 40 illustrations. Translated by Walter James Highman, M. D., New York. New York: The Macmillan Company, 1929.

A review of the German edition of this book appeared in the April, 1929, issue of the Journal, p. 374.

LES RAYONS, ULTRA-VIOLETS ET INFRA-ROUGES. Par W. Vignal, Electro-radiologist des Hôpitaux de Paris. Paper. Price, 30 Fr. Pp. 239, with 28 illustrations. Paris: Gaston Doin & Cie, 1930.

RÖNTGENUNTERSUCHUNGEN AM INNENRELIEF DES VERDAUUNGSKANALS. Ein Beitrag zur klinischen Röntgendiagnostik insbesondere von Entzündung, Geschwür und Krebs. Von Dr. Hans Heinrich Berg, A. O. Professor an der Universitat Berlin, Oberarzt der z. Medizin. Universitatsklinik der Charité. Paper, price 27 Marks; bound, price 29 Marks. Pp. 198, with 193 illustrations. Leipzig: Georg Thieme, 1930.

GRUNDLAGEN DER ORTHOGIAGRAPHISCHEN HERZGRSÖSEN- UND THORAXBREITENBEURTEILUNG IM KINDESALTER, Von Dr. Oskar Kirsch. Paper. Pp. 110, with 24 tables and 12 orthodiagrams in the text. Berlin: S. Karger, 1929.

INDEX TO ABSTRACTS

ROENTGEN DIAGNOSIS

Head

GASTEIGER, H., and GRAUER, S.: The diagnosis of double perforation of the eyeball with the aid of air inflation of Tenon's space 93

BUSTIN, E., LEIST, M., and PRIESEL, R.: Roentgenologic studies of milk teeth. 1. The normal set of teeth in children till the eruption of the sixth year molars 93

IMRIE, DAVID A.: The radiographic and microscopic appearance of infections of the teeth and the surrounding tissues 94

GRYNKRAUT, B., and LEWENFISZ, H.: On a dermoid cyst of the tongue; roentgenologic examination by means of lipiodol and operative check 94

Neck and Chest

CORYLLOS, POL. N., and BIRNBAUM, GEORGE L.: The size of the consolidated lung in lobar pneumonia 95

CORYLLOS, POL. N.: Bronchoscopic findings in lobar pneumonia 95

BELOT, J., NEBOUT, and DERUAS.: A case of pulmonary metastases from sarcoma 95

KONSTAM, G. L. S.: Syphilis of the lung with pulmonary arteritis (Ayerza's disease) 95

DANELIUS, GERHARD.: Experiments on the course of the upper borders of the lungs in the roentgenogram 96

ST. GRAUR, EMIL.: The roentgenologic image of azygos lobe 96

DE ABREU, MANOEL.: Roentgen geometry of the mediastinum 96

ARMAND-DELILLE, P.-F., LESTOCQUOY, CH., and VIBERT, J.: Critical study of the semeiology of tuberculous tracheobronchial adenopathy in infants 97

LENK, ROBERT.: Systematic mediastinal diagnosis, illustrated by cases of malignant tumors of the thymus 97

MIXTER, CHARLES G., and CLIFFORD, STEWART H.: Congenital mediastinal cysts of gastrogenic and bronchogenic origin 97

SCHERF, D., and ZDANSKY, E.: Roentgen kymographic tracings of true alternating heart in man 98

POPP, L.: An interesting case of megalo-esophagus 98

ZWICKER, A.: A case of hernia diaphragmatica dextra hepatis with a consideration of differential diagnosis 98

Abdomen

CHIRAY, M., LOMON, A., and ALBOT, G.: The gall-bladder; its roentgenologic and clinical topography; its exploration of abdominal palpation 99

HANGANUT, MARIUS.: Fluidobarit, a new barium preparation for the exploration of the digestive tract 99

SCHOLTZ, ANDREAS, and MOHOS, ERNST.: Gastric roentgen examinations in ephedrine action 100

ALBRECHT, H. U.: Roentgenological and clinical consideration of the question of ulcus carcinomatosum ventriculi 100

TIXIER, LEON, RONNEAUX, GEORGES, and DE SEZE, S.: Diverticular image of the duodenal bulb produced by an ulcer penetrating into the pancreas 100

NOSCHEL, E.: Roentgenologic observations on the function of the small intestine in acute hemorrhagic colitis in children 100

AMBERGER, and ROVEKAMP.: A contribution to benign stenosis of the small intestine 101

CZEPA, ALOIS.: Further contributions to the roentgen diagnosis of the appendix 101

IACOBVICI, I., HANGANUT, M., and SPARCHEZ, T.: A consideration of a case of Hirschsprung's syndrome 103

Gynecology and Obstetrics

GOSSET, LEDOUX-LEBARD and BÉCLÈRE, CL.: Lipiodol diagnosis of valvular hydrosalpinx 103

BELOT, J., TEDESCO, and BECLERE, CLAUDE.: A case of tubal reaction following intrauterine injection of lipiodol 103

Genitourinary System

TRUCHOT, P.: Cancers of the kidney demonstrated by pyelography 103

Nervous System

PEIPER, HERBERT.: Examinations for relief diagnosis of diseases of the spinal cord and its membranes 104

Skeletal System

KEMKES, B.: On familial disturbances of the bony growth as shown in the roentgenogram 105

FITCHET, SETH M.: Cleidocranial dysostosis: hereditary and familial 105

ZUKSCHWERDT, L.: Processus supracondyloideus humeri and foramen supracondyloideum 106

ROTHBART, LADISLAUS.: 1. Fractura manubrii sterni. 2. Sinus "alveolaris" 106

DANDY, WALTER E.: Loose cartilage from intervertebral disk simulating tumor of the spinal cord 106

POLGAR, FRANZ.: On interarcual calcifications of the vertebrae 107

SCHMORL, G.: Calcification of the vertebral discs with a consideration of the appearance of the discs in infectios spondylitis 107

BLOUNT, WALTER P.: Hodgkin's disease; an orthopaedic problem 107

SPURRIER, ETHELBERT.: Joint sequestra of osteo-myelitis 108

MOUCHET, ALBERT.: Osteochondritis of the hip 108

PHEMISTER, D. B.: Chronic fibrous osteomyelitis 108

HIRSCH, EDWIN F., and RYERSON, EDWIN W.: Necrosis of the distal epiphysis of the right femur 109

BAUER, JULIUS, and KIENBOCK, ROBERT.: On the knowledge of the bone and joint changes in alcaptonuria .. 109

KIDNER, FREDERICK C.: The prehallux (accessory scaphoid) in its relation to flat foot 110

WEISS, KONRAD.: On "malacia of the os naviculare pedis" 111

ROENTGEN AND RADIUM THERAPY

FUHS, HERBERT, and KONRAD, JOSEF.: On further indications for the Bucky rays in dermatology 111

GROSGLIK, ADAM.: Skin manifestations observed in the course of chronic myeloid leucemia as a result of roentgen applications 112

FREUND, LEOPOLD.: The x ray treatment of wounds 112

DELHERM, L., and BEAU, H.: Note on radiotherapy in the treatment of arteritis obliterans 113

DEPLATS and LANGERON.: Favorable action of irradiation of the suprarenal region in arteritis obliterans 113

GOUIN, J., and BIENVENUE, A.: On the subject of radiotherapy in the treatment of arteritis obliterans and

the favorable action of the irradiation of the suprarenal region in arteritis obliterans 113

MONIER-VINARD, DELHERM, and BEAU.: Radiotherapy of Raynaud's disease 114

NEMOURS-AUGUSTE, and BARRIEU.: Roentgen therapy in the treatment of angina pectoris 115

CHAPERON.: On the subject of roentgen therapy in the treatment of angina pectoris 115

SEISSER, FRANZ.: Experiences with roentgen irradiation of genital inflammations 115

CUTLER, MAX.: Radiosensitive intra oral tumors 116

JOLY, M., and QUIRIN.: Direct or secondary action of roentgen therapy in cancer? 116

WINTZ, HERMAN.: Results of radiation therapy in uterine and mammary carcinomas 117

FENWICK, P. CLENNELL.: The radium climacteric 118

AVIRAGNET, and DUHEM, P.: Periosteal fibrosarcoma of the dorsal vertebral column arrested by roentgen therapy 119

MISCELLANEOUS

SCALITZER, MAX.: The technique of the roentgen examination of the four upper dorsal vertebrae in lateral projection 119

DITTMAR, OTTO.: Semilateral projection of the lumbo sacral region 120

HASSELWANDER, A.: Dangers of the further development of roentgen stereoscopy 120

ALBERTI, W.: Tele chiasmo roentgen stereoscopy 121

SCHEKTER, L.: Double and simultaneous pulmonary roentgenography 121

PHILIPS, HERMAN B.: A simple complete diagnostic x-ray unit adapted to all possible surgical and medical needs 121

PATEY, D. H., and SCARFF, R. W.: Further observations on the histology of carcinoma of the breast 121

BETTMAN, RALPH B., KELLY, JOHN, and CROHN, NATHAN.: The effect of intrabronchial injections of iodized poppy seed oil 40 per cent; an experimental study on dogs .. 122

SCHREUS, H. TH.: On the distribution of the bismuth deposits in intramuscular injection of insoluble salts and the duration of their roentgen visibility 123

KUSTER, A.: The action of roentgen rays on the nyctinastic and seismonastic movements 123

KUSTER, A.: The irradiation of the roots of young lupine plants and the influence on the formation of rootlets 124

VARGA, GEZA.: The tube end tension of the roentgen apparatus with rotating rectifier and its mode of action 124

ABSTRACTS OF ROENTGEN AND RADIUM LITERATURE

ROENTGEN DIAGNOSIS

Head

Gasteiger, H., and Grauer, S. Zur Diagnose der Doppelperforation des Augapfels mit Hilfe von Lufteinblasung in den Tenonschen Raum. (The diagnosis of double perforation of the eyeball with the aid of air inflation of Tenon's space). *Fortschr. a. d. Geb. d. Röntgenstrahlen*, August, 1929, *40*, 272-278.

In localizing foreign bodies of the eye it often happens that the foreign body is situated in the structures of the posterior wall of the eyeball without there being a possibility of determining whether or not the foreign body still lies within the eyeball or whether it has penetrated through the posterior wall of the eyeball into the orbit. Such a case was observed by the authors in a man twenty-three years of age, who was admitted to the clinic with the history of a foreign body of the eye, and in which the foreign body was localized to the posterior wall of the eyeball. Since the magnet failed to extract the foreign body it was suspected that this might already lie in the orbit, thus producing a double perforation of the eyeball. In order to definitely settle the question, 10 to 15 c.c. sterile air was insufflated into Tenon's capsule and the roentgenograms taken revealed that the foreign body had indeed penetrated into the orbit.

Since an exact diagnosis of a double perforation of the eyeball is very important from the point of view of therapeutic procedures, it is advocated that the air insufflation of Tenon's space be attempted in all doubtful cases.

The method is of real practical value and certainly superior to the more recently advocated procedure of Speziale-Picciché who for the same purpose inject lipiodol into Tenon' space. Lipiodol, being a contrast medium, may entirely obstruct the visibility of the foreign body and besides it may act itself as a foreign body. The unsuccessful attempts of Speziale-Picciché to inject air into Tenon's space must be due to the fact that they used a straight cannula permitting the diffusion of the air into the subconjunctival and probably retrobulbar space immediately following the injection. For this reason the authors use a curved cannula and after going through the conjunctiva they carry the needle between the conjunctiva and Tenon's capsule for a short distance before inserting it into the Tenon capsule itself. Thus the escape of the air is prevented.—*T. Leucutia.*

Bustin, E., Leist, M., and Priesel, R. Röntgenologische Studien am kindlichen Gebiss. I. Mitteilung. Das normale kindliche Gebiss bis zum Durchbruch der Sechsjahr-Molaren. (Roentgenologic studies of milk teeth. I. The normal set of teeth in children till the eruption of the sixth year molars.) *Fortschr. a. d. Geb. d. Röntgenstrahlen*, July, 1929, *40*, 80-88.

On account of the technical impossibility of taking intraoral films in children, the investigations were confined only to the front teeth and to the rami of the lower jaw, which could be examined in roentgen films. The frontal teeth were roentgenographed either in postero-anterior or less frequently in anteroposterior position (54 kv., 130 ma., 1/10 sec.), while the rami of the lower jaw were roentgenographed according to the technique of Eisler.

In a first series the roentgenologic appearance of the milk teeth was examined in infants from three weeks to five months of age. It was found that there is very little variation from the statistical data found in the textbooks, with the exception of the calcification of the left permanent molars. While according to Brady's schematic illustration of the temporary and permanent teeth the calcification of the cusps of the left molars has already begun in the twenty-fifth embryonal week and at birth the grinding surface already appears in the form of a united disc, the authors found that a roentgenologically visible calcification of the cusps appears only from the third to fifth month and that at this time there is as yet no union between the cusps. Comparative examinations on cadavers of the newborn and sucklings revealed indeed that the grinding surface of the sixth has no calcium consistency and that it appears soft, elastic and of an opaque gray color, instead of white as in the case of

calcification. This observation also clears up the fact that the grinding surface of the sixth shows the most severe defects in early rickets, while this would be unexplainable if one assumes that the calcification was already complete at the time of birth.

In a second series the examination was carried out in children between seven months and five years of age, and especially the relation of the milk teeth to the canalis mandibularis was studied. Orban is his article "Development and Histogenesis" has stated that the growth of the upper frontal teeth begins from a fixed line and is confined only to the oral portion of the germ. According to the authors' investigations the fixed line of the lower jaw corresponds to the canalis mandibularis, However, in contradistinction to Orban's assumption, the germs of the lateral permanent teeth in their first development show a distinct separation from the canalis mandibularis. Thus the authors found that all molar germs are oblique and appear in their first development in an elliptic line near the alveolar margin separated by a relatively wide zone from the canalis mandibularis. In the second stage the sacs appear enlarged and nearer the canalis mandibularis; the teeth are still oblique, but somewhat less so than in the first stage. In the third stage the germ is already vertically placed and the entire space between the alveolar margin and the canalis mandibularis is taken in by the sacs; the crown is entirely calcified and with the beginning of root formation and absorption of the alveolar process the eruption starts. The development of the premolar germs occurs in a similar way.—*T. Leucutia.*

IMRIE, DAVID A., The radiographic and microscopic appearance of infections of the teeth and the surrounding tissues. *Lancet*, Aug. 24, 1929, *2*, 375-378.

Imrie insists on roentgenograms of the teeth showing fine detail, which enable one to recognize quickly and surely, minute variations from the normal or healthy, appearance of the teeth and surrounding tissues. Alterations produced in the bone as the result of infection are three: (1) thickening of the trabeculae with concomitant reduction in size and shape of the intertrabecular spaces, i.e., sclerosis; (2) rarefaction of the trabeculae with the necessary enlargement of these spaces, and (3) destruction varying from the loss of a few of the bony trabeculae to the production of macroscopic cavities in the bone.

In 8 cases Imrie removed small pieces of bone of the alveolar process from around teeth reported as infected after roentgen-ray examination. These fragments were removed by a small trephine of about 3 mm. mounted in the handpiece of a dental engine. The fragments were then fixed and stained and examined microscopically.

The following are the author's conclusions: (1) None of the slides revealed microorganisms, perhaps bacteriological culture would be necessary to establish their presence. (2) The osseous lesions are those that result from inflammation. (3) The roentgenographic appearance corresponding to the inflammatory lesions are: (*a*) sclerosis, when the trabeculae present the so-called lines of secondary calcification; (*b*) a haziness of the trabecular shadows when the microscopic examination revealed the signs of inflammation. (*c*) This inflammation is accompanied by sclerosis when the inflammation is chronic. On the contrary, when the inflammation is acute, sclerosis is absent. (4) The histological and roentgenographic examinations correspond in general with the clinical findings. (5) The particular image of the bone in the dental roentgenograms in the case of osteitis deformans may permit of an earlier diagnosis of this malady.—*R. S. Bromer.*

GRYNKRAUT, B., and LEWENFISZ, H. Sur un cas de kyste dermoïde de la langue, examen radiologique lipiodolé et contrôle opératorie. (On a dermoid cyst of the tongue; roentgenologic examination by means of lipiodol and operative check.) *Bull. et mém. Soc. de radiol. méd. de France*, January, 1929, *17*, 50-52.

A dermoid cyst of the tongue occurring in a girl twenty-two years of age is briefly described. At the time of examination there was a swelling of the tongue with edema, difficulty in swallowing and breathing and an elevation of temperature to 38°C. An incision of the inferior aspect of the tongue led to an evacuation of 30 to 40 c.c. of pus, followed by improvement in the general condition of the patient. The cystic cavity was explored by means of lipiodol and it was found to be a dermoid cyst, no doubt of congenital origin. The cyst was extirpated and complete healing resulted.—*T. Leucutia.*

Neck and Chest

Coryllos, Pol. N., and Birnbaum, George L. The size of the consolidated lung in lobar pneumonia. *Am. J. M. Sc.*, July, 1929, *178*, 15-20.

The size of the affected lobes in lobar pneumonia, contrary to the generally accepted opinion, is smaller than that of the healthy lobes. The enlargement of the consolidated lung is only apparent and is due to the collapse of the healthy lung when the thoracic cavity is opened.

A careful analysis of the physical and especially the roentgenographic findings shows facts different from the above general opinion. The following are some of the points discussed by the authors: (1) The constant elevation of the diaphragm on the affected side. (2) The absence of displacement of the heart and trachea toward the healthy lung. (3) The often reported displacement of the heart and mediastinal structures toward the affected side. (4) The roentgenographic findings in experimental pneumonia in dogs which are not unlike those found in atelectasis.

The decreased size of the pneumonic lobe, as shown by roentgen examination of the chest and post-mortem studies of the lung following clamping of the trachea points to a similar pathogenesis in pneumonia and atelectasis.—*Karl Kornblum.*

Coryllos, Pol. N. Bronchoscopic findings in lobar pneumonia. *Am. J. M. Sc.*, July, 1929, *178*, 8-15.

The author reports 9 cases in which bronchoscopy was used in the treatment of lobar pneumonia. He does not make any conclusions as to the efficacy of the bronchoscopy except that it was not a shock to patients even when their condition was poor. In the series 6 patients recovered and 3 died.

In every one of the cases the bronchus corresponding to the affected lung area and only this one was found occluded with viscid exudate and air circulation interrupted. The author's findings seemed to support the experimental facts upon which the theory was based that lobar pneumonia starts as a pneumococcic atelectasis.—*Karl Kornblum.*

Belot, J., Nebout, and Déruas. Un cas de métastase pulmonaire: sarcome. (A case of pulmonary metastases from sarcoma.) *Bull. et mém. Soc. de radiol. méd. de France*, February, 1929, *17*, 73-74.

A case of a huge tumor of the right lower lung is described in a girl fifteen years of age who two years previously had an amputation of the right thigh for a sarcoma of the femur. Through the fact that later similar tumors appeared in other regions a diagnosis of metastatic sarcoma was made.

The condition at the roentgen examination gave the impression of a cystic collection rather than that of a metastatic sarcoma. In connection with this it is emphasized that a differential diagnosis between certain types of metastases and cysts, especially hydatid cyst, is often impossible.—*T. Leucutia.*

Konstam, G. L. S. Syphilis of the lung with pulmonary arteritis (Ayerza's disease). *Lancet*, Oct. 12, 1929, *2*, 756-762.

The author, in reviewing the literature of syphilis of the lung with pulmonary arteritis, states that in 1901, Professor Ayerza of the National University of Buenos Aires drew attention in an unpublished clinical lecture to the morbid entity of "cardicos negros," a syndrome which Escudero claims to have shown in 1905 to be associated with generalized sclerosis of the pulmonary artery and hypertrophy of the right ventricle. Ayerza left no written account of his observations, but if we accept his pupil Arrillaga's writings as embodying the teaching of his master, Ayerza's claim to a place in medical nosology must be based on his discovery of the "black cardiac," syndrome due to syphilis of the lung and pulmonary arteries. The many accurate macroscopic and microscopic descriptions of undoubted syphilitic pulmonary arteritis, confirmed by Warthin's and Elizaldo's demonstration of the *Spironema pallidum* in the wall of such arteries, have placed the existence of this entity on a sound footing.

Konstam reports one case. The roentgen-ray examination showed enlargement of the heart to the right and the left, the cardiac shadow presenting a globular appearance. The left border of the heart lay three-quarters of an inch external to the mid-clavicular line. The pulmonary artery was unduely prominent,

lying below the aortic knuckle. Both lung roots were obscured by the large cardiac shadow. General coarse mottling was shown at the roots of both lungs. The patient, admitted with cyanosis, severe though by no means black, with congestive heart failure, with edema, yet with normal heart sounds was at first regarded as a case of heart failure with normal rhythm, probably due to syphilis affecting the orifices of the coronary arteries. The roentgen-ray appearance showing no aortic enlargement, but prominence of the pulmonary artery, shed doubt on this preliminary diagnosis, and it was not until necropsy was obtained that the exact nature of the underlying lesion was determined. The necropsy report was: "Failure of the hypertrophied right heart. Syphilitic interstitial fibrosis of lungs and extensive endarteritis of the pulmonary artery."

Any disease process leading to pulmonary hypertension may produce symptoms clinically indistinguishable from Ayerza's disease. Chronic disease of the lung and pleura, chronic valvular lesions of the heart, particularly mitral stenosis, congenital morbus cordis, malformations of the pulmonary artery, thoracic deformities, should all be excluded before the diagnosis is suggested. Erythremia (Vaquez-Osler's disease) must also be excluded. Reliance must be placed on the clinical, roentgenographic and electrocardiographic evidence of dilatation and hypertrophy of the right ventricle and pulmonary artery, together with evidence of syphilis.—*R. S. Bromer.*

DANELIUS, GERHARD. Experimentelles über den Verlauf der oberen Lungengrenze im Röntgenbilde. (Experiments on the course of the upper borders of the lungs in the roentgenogram.) *Fortschr. a. d. Geb. d. Röntgenstrahlen*, August, 1929, *40*, 249-261.

The accessory shadow of the second rib was studied by means of experimental roentgenograms. Cadavers, after the subsidence of the rigor mortis, were placed in a sitting position and roentgenograms of the upper portions of the lungs were taken. Then the thorax was opened, the lungs separated from the pleura and second roentgenograms made. Finally, the apical pleura was sprayed with contrast solution and third roentgenograms taken.

It was found that the accessory shadow of the second rib as demonstrated in the first roentgenogram corresponded to the apical pleura and consequently to the upper border of the lungs in the second and third roentgenograms. Thus the statement of Albers-Schönberg that the accessory shadow of the second rib represents the upper border of the lungs is experimentally proved.

In the course of the experiments it was also found that a great part of the medial portion of the upper lung is superimposed in the roentgenogram by the mediastinum and spine. It is suggested that lesions occurring in this region, as for example, tuberculosis, might entirely escape detection.

Further experiments are in progress in order to determine the best technique for the roentgenologic visualization of these superimposed portions of the lung.—*T. Leucutia.*

ST. GRAUR, EMIL. Imaginea radiologică a lobului venei azygos. (The roentgenologic image of azygos lobe.) *Clujul med.*, October, 1929, *10*, 479-481.

Three cases of azygos lobe are briefly described and their roentgenograms presented.

In connection with this the roentgenologic appearance of the azygos lobe is discussed. Differential diagnosis includes substernal thyroid, thymic enlargement and especially pleuritic bands.—*T. Leucutia.*

DE ABREU, MANOËL. Radiogéometrie du médiastin. (Roentgen geometry of the mediastinum.) *Bull. et mém. Soc. de radiol. méd. de France*, February, 1929, *17*, 66-69.

The mediastinum represents a geometrical space containing the tracheobronchial air tube and compact tissues (such as the cardiovascular walls, blood, lymph nodes, lymphatic vessels, connective tissue, pleura, thymic capsule, ligaments, pericardium and fat. While the tracheobronchial air tube shows a variation in contrast which is sufficient for its differentiation, the compact tissues, which in fact are the most important from the point of view of differential diagnosis, do not permit discernment between themselves.

The author analyzed the geometric arrangement of the tissue elements of the mediastinum and the influence resulting therefrom on the roentgen visibility of the mediastinal contents.

The geometric relation of the lung and mediastinum (convex linear outline) is especially important from this standpoint.

The conditions were checked up on paraffin molds taken on cadavers and it was found that the roentgenograms of the molds gave images which were identical to those of the anatomic mediastinum.

The conclusion is reached that the contour and the degree of opacity of the mediastinal contents are determined not by the specific density of the individual tissue elements, as hitherto supposed, but by the depth of the mediastinum, as a whole, and by the configuration of the lung-mediastinal surface.—*T. Leucutia.*

Armand-Delille, P.-F., Lestocquoy, Ch., and Vibert, J. Étude critique de la séméiologie de l'adénopathie trachéo-bronchique tuberculeuse de l'enfance. (Critical study of the semeiology of tuberculous tracheobronchial adenopathy in infants.) *Presse méd.*, Sept. 28, 1929, *37*, 1262-1265.

The anamnestic data as well as the clinical signs are of little help in the diagnosis of tracheobronchial adenopathy in children. The roentgen examination forms the sole method of diagnosis.

In analyzing the value of the roentgen examinations in different views, the authors arrive at the conclusion that the examination in the posteroanterior view gives information only in case of involvement of the lymph nodes lateral to the trachea or of the interbronchial lymph nodes on the right side, and that, even here, caution must be exercised so as not to confuse the normal vascular shadows or opacities due to pulmonary lesions with the shadows of the lymph nodes.

The examination in the oblique view does not give much additional information.

The examination in the straight lateral view, on the contrary, leads to excellent results since it permits the exploration of the clear space in front of the vertebral column. This is important especially in the diagnosis of enlargement of the lymph nodes at the tracheal bifurcation or of the left interbronchial lymph nodes.

It is advised that roentgenograms in the posteroanterior and in the straight lateral position be taken as a routine procedure in all cases suspicious of tracheobronchial adenopathy.—*T. Leucutia.*

Lenk, Robert. Systematische Mediastinaldiagnostik, erläutert am Beispiel der malignen Thymustumoren. (Systematic mediastinal diagnosis, illustrated by cases of malignant tumors of the thymus.) *Fortschr. a. d. Geb. d. Röntgenstrahlen*, August, 1929, *40*, 278-283.

The difficulty of the roentgenologic diagnosis in mediastinal conditions lies in the fact that the mediastinal space contains organs and pathological processes which absorb and diffuse the rays to an equal degree. This means that the different intensities of the roentgenologic shadows which are of such great aid in the diagnosis of lung tumors are of absolutely no avail in the mediastinal diagnosis.

The criteria which can be used to some extent in establishing differential diagnosis of different mediastinal tumors are: the position and situation of the projected shadow, its relation to the neighboring organs, its symmetrical or asymmetrical appearance, its contour (elliptic, rounded, etc.), and especially its radiosensitiveness, the so-called roentgen therapeutic test.

Three cases are briefly described in which the diagnosis was established on the basis of the above criteria. Later post-mortem examinations confirmed the diagnosis.—*T. Leucutia.*

Mixter, Charles G., and Clifford, Stewart H. Congenital mediastinal cysts of gastrogenic and bronchogenic origin. *Ann. Surg.*, Oct., 1929, *90*, 714-729.

Mediastinal tumors are rarely encountered in children. In 1928 Kerr collected 139 thoracic dermoids and teratomas and only 11 occurred in the first decade of life. The authors report 3 cases, 2 of which were apparently gastrogenic in origin and one bronchogenic. The symptoms are usually those of pressure. The course of the disease has been divided into a latent and active stage. Some of the lesions may be discovered accidentally or at post mortem, never having caused any symptoms. The 3 cases reported here were in children seven weeks, three months, and twenty-two months old, the last being the only one to survive, and this

case has been followed for eight months. The authors recommend a one stage operation without drainage. They state that roentgenographic study is of little aid in the differential diagnosis. They discuss the origin of the teratomas in this region from an outbud of the foregut in the four millimeter embryo and describe the possibilities of the gastrogenic and bronchogenic origin of mediastinal cysts. —*E. P. Pendergrass.*

SCHERF, D., and ZDANSKY, E. Röntgenkymographische Schreibung von echtem Herzalternans beim Menschen. (Roentgen kymographic tracings of true alternating heart in man.) *Fortschr. a. d. Geb. d. Röntgenstrahlen*, July, 1929, *40*, 60-63.

All attempts to observe or register roentgenographically the alternation in the heart activity of the pulsus alternans in man have remained fruitless.

By making use of roentgen kymography the authors investigated the changes of the size of the heart following intravenous injection of atropine and adrenalin, following the inhalation of amyl nitrate and in a case of paroxysmal tachycardia.

Stimulated by the results obtained by these investigations, they also applied the roentgen kymograph in a case of pulsus alternans occurring in a man forty-five years of age who in 1914 suffered from severe dysentery with complicating articular rheumatism, in 1921 developed signs of acromegaly and in 1928 came under observation with a progressive insufficiency of the heart.

Pulsus alternans was so pronounced that only every second pulse beat could be felt, that is, of the 80 regular heart beats, only 40 were transmitted to the periphery. The kymograph revealed that each greater concontraction of the heart was followed by a smaller contraction. Three explanations are possible for this alternating function of the heart: (1) either certain parts of the left ventricle contract only feebly or show no contraction at all (partial hyposystolia or asystolia); (2) or the entire heart contracts alternatingly (total alternating systolia), (3) or primary dynamic conditions produce difference in the rate of the contractions of the heart (Wenckebach). The roentgen kymograph does not indicate which of the three possibilities is the correct one.—*T. Leucutia.*

POPP, L. Despre un caz interesant de megaoesofag. (An interesting case of megaloesophagus.) *Clujul med.*, September, 1929, *10*, 432-435.

A case of megalo-esophagus is described in a woman forty-two years of age who was observed roentgenologically for a period of five years. The first examination made in 1923 revealed two spastic zones of the esophagus, one at the level of the aortic arch and another just above the cardia, there being at that time only a very slight enlargement of the lumen of the esophagus. The examination five years later revealed the evidence of only one spastic zone (above the cardia) and an enormous dilatation of the entire esophagus.

The patient was first treated by forced dilatation, with an improvement lasting for a period of one and a half years, and then with administration of papaverine and atropine, with an improvement lasting for over two years.

Based on the fact that the first examination revealed only spastic areas and that the patient responded favorably to the papaverine-atropine treatment, the opinion is expressed that the condition must be the result of a functional spasm of the esophagus, later resulting in secondary dilatation with megaloesophagus.—*T. Leucutia.*

ZWICKER, A. Ein Fall von Hernia diaphragmatica dextra hepatis nebst Beispielen zur Differentialdiagnose. (A case of hernia diaphragmatica dextra hepatis with a consideration of differential diagnosis.) *Fortschr. a. d. Geb. d. Röntgenstrahlen*, July, 1929, *40*, 51-57.

A case of right-sided diaphragmatic hernia is described in a man twenty-nine years of age who at the time of examination, apart from a chronic bronchitis and frontal sinus catarrh, presented no symptomatology.

Two cases of diaphragmatic paralysis resulting from tumor compressions are added for the consideration of the differential diagnosis.

The conclusion is reached that diagnosis can be made only by exclusion and that the diagnosis is always more difficult on the right

side than on the left. Even the application of pneumoperitoneum cannot establish a definite differentiation between hernia and relaxation of the diaphragm.—*T. Leucutia.*

Abdomen

Chiray, M., Lomon, A., and Albot, G. La vésicule biliaire; sa topographie radiologique et clinique; son exploration par le palper abdominal. (The gall-bladder; its roentgenologic and clinical topography; its exploration by abdominal palpation.) *Presse méd.*, Nov. 6, 1929, *37*, 1437-1440.

The use of cholecystography has led to a new topography of the gall-bladder, especially as regards its relation to the spine and to the anterior abdominal wall. That the position of the gall-bladder as demonstrated in cadavers or found on the operating table did not always correspond to the position in the living has been long suspected but it remained for cholecystography to provide the definite proof.

Authors found in this respect that the topography of the normal gall-bladder varies from one individual to the other and in different positions of the same individual.

The variations from individual to individual depend on the general anatomic type of the patient (hypersthenic, sthenic, hyposthenic, or asthenic), on the tonus of the gall-bladder (orthotonic, atonic, stasic, ptotic, etc.), and on the influence of the neighboring organs (high liver in plethoric and obese patients, low liver in thin patients. etc.).

The variations due to changes in position depend on whether examination is done with the patient standing, or lying on his back or face downward. The relation of the gall-bladder to the vertebral column and to the anterior abdominal wall was studied in all these instances.

(1) In dorsal decubitus the gall-bladder assumes the classic position described by anatomists and found at operation. Thus it lies obliquely outward and downward just underneath the border of the liver, in many instances nearing the horizontal plane.

(2) In the standing or sitting position, due to the sinking of the liver, there is a sinking of the gall-bladder, its lower pole occasionally reaching as far down as the iliac crest.

(3) In ventral decubitus it occupies an intermediate position between that of the standing (or sitting) position and dorsal decubitus and its axis is nearer the vertical line.

(4) In left lateral decubitus it moves towards the midline and the anterior abdominal wall.

Based on the above cholecystographic findings the authors developed two new methods of palpation for the clinical exploration of the gall-bladder. As is known, until now the gall-bladder was palpated either with the patient on the back by placing the hand underneath the lower border of the liver, or in rare instances, according to Murphy's method.

The two new methods proposed by the authors are: (*a*) exploration with the patient in left lateral decubitus, and (*b*) exploration with the patient in sitting position.

(*a*) For the exploration in left lateral decubitus, the patient is placed on his left side (nearly reaching ventral decubitus) with the lower extremities flexed and the spine curved. The examining physician stands behind the back and with the right hand palpates the epigastric region near the midline.

(*b*) In the exploration with the patient in sitting position the patient is seated at the edge of the bed with the spine passively curved, the head bowed and with the hands holding the edge of the bed. The examining physician stands to the right of the patient and places his right hand, palm upward, and fingers in extension, horizontally on the abdominal wall just a little to the right of the umbilicus. After complete relaxation the hand is pressed in until the tips of the fingers reach the vertebral column and then the fingers are flexed upward towards the lower border of the liver. In this manner the fingers reach the region of the hilus of the neck of the gall-bladder and any pain localized to this region is immediately detected.

The two methods are of value especially in mild cholecystitis without definite clinical symptomatology and in all instances in which an exact localization of the source of pain (gall-bladder, pylorus, duodenum) is necessary.—*T. Leucutia.*

Hânganut, Marius. Fluidobaritul, un nou preparat de bariu pentru explorarea tubului digestiv. (Fluidobarit, a new barium preparation for the exploration of the digestive tract.) *Clujul med.*, October, 1929, *10*, 493.

A new barium preparation is described, the formula of which is as follows:

Baryum sulfuricum praecip. pulv. subtil.	100 gm.
Sugar	20 gm.
Inoffensive aromatic substance	Q.S.
Distilled water	200 c.c.

The advantages of the preparation are that a perfectly homogeneous suspension of the barium sulphate is produced and that on account of this it can be kept ready for examination at any time.

Comparative tests with citobaryum and ventrobarit revealed that the fluidobarit is superior inasmuch as the suspension lasts for a much longer time.—*T. Leucutia.*

SCHOLTZ, ANDREAS, and MOHOS, ERNST. Magen-Röntgenuntersuchungen in Ephedrinwirkung. (Gastric roentgen examinations in ephedrine action.) *Fortschr. a. d. Geb. d. Röntgenstrahlen*, August, 1929, *40*, 262-266.

Since the chemical composition of ephedrine is similar to that of adrenalin, it is only natural that their biological action should also be more or less similar. Experiments were carried out by the authors in order to determine the effect of ephedrine on the human stomach.

First a routine gastric examination by means of a contrast meal was undertaken, then the next day 0.05 gm. ephedrine (Merck) was injected, and ten to fifteen minutes later a second gastric examination made. Twenty-two cases were used for these experiments.

It was found that ephedrine has an inhibiting action on the tonus and peristalsis of the stomach, and that it prolongs the emptying time. A direct action on the pylorus could not be demonstrated. The effect of the ephedrine on the stomach, as a whole, is more uniform and more permanent than that of adrenalin. Its therapeutic application is indicated in the cases in which a delay in the empyting of the stomach is desired. No untoward symptoms were observed from its use.—*T. Leucutia.*

ALBRECHT, H. U. Röntgenologisches und Klinisches zur Frage des Ulcus carcinomatosum ventriculi. (Roentgenological and clinical consideration of the question of ulcus carcinomatosum ventriculi.) *Fortschr. a. d. Geb. d. Röntgenstrahlen*, July, 1929, *40*, 26-31.

The author presents a case of a penetrating ulcer localized to the posterior wall of the stomach in a woman thirty-one years of age who had gastric symptoms for a period of two years. The roentgen examination revealed a crater at the site of the ulcer which could not be classified either roentgenologically or clinically as malignant but which later on microscopic examination proved to be carcinoma.

In connection with this, the author discusses the incidence of carcinoma in old gastric ulcers.

He also considers the roentgenologic signs which might lead to an earlier diagnosis of the condition and arrives at the conclusion that in some instances diagnosis is entirely impossible. The morphologic changes of the mucous membrane of the stomach as a rule show nothing of diagnostic importance.—*T. Leucutia.*

TIXIER, LÉON, RONNEAUX, GEORGES, and DE SÈZE, S. Image diverticulaire du bulbe duodénal par ulcus extériorisé intra-pancréatique. (Diverticular image of the duodenal bulb produced by an ulcer penetrating into the pancreas.) *Bull. et mém. Soc. de radiol. méd. de France*, January, 1929, *17*, 21-25.

A case of penetrating ulcer of the duodenal bulb with perforation into the pancreas is described in a man thirty-nine years of age. This case is interesting because of the peculiar location of the ulcer, the absence of other deformities of the bulb and especially because of the similarity of the lesion to a true diverticulum of the duodenum.

Following surgical intervention which consisted in a posterior transmesocolectomy and gastroenterostomy, there was complete healing. —*T. Leucutia.*

NÖSCHEL, E. Röntgenologische Beobachtungen der Dünndarmfunktion bei der Colitis haemorrhagica acuta im Kindesalter. (Roentgenologic observations on the function of the small intestine in acute hemorrhagic colitis in children.) *Fortschr. a. d. Geb. d. Röntgenstrahlen*, July, 1929, *40*, 76-78.

The series includes 25 cases of acute hemorrhagic colitis observed in children under five years of age.

The procedure of examination consisted in the administration of a barium mixture on an empty stomach, and subsequent roentgen examinations made at one, three, ten and twenty-four hour intervals, p.c., films being taken

in both ventrodorsal and dorsoventral positions.

According to the severity of the symptoms, the cases were divided into three groups: (1) rather mild cases of short duration, without toxic manifestations (8 cases); (2) moderately severe cases with gradual loss of strength and occasional heart weakness (5 cases); (3) very severe cases with marked nutritional disturbances, toxicosis and lethal outcome (12 cases).

The examination revealed that the roentgenologic appearance of the functional disturbances of the small intestine depends on the severity of the clinical picture. While in cases of Group 1 except for the rapid emptying there was practically no demonstrable roentgen evidence of the disease, in Group 2 there was a peculiar distribution of the barium with areas of accumulation of gas and in Group 3 there was always a severe disturbance of the motility. This consisted in atonicity and spasticity of the different segments of the small intestine, with very marked accumulation of gas in the atonic segments and with a peculiar distribution of the barium in the spastic segments. The normal relief of the mucosa of the small intestine was also severely disturbed. —*T. Leucutia.*

Amberger and Rövekamp. Ein Beitrag zur benignen Dünndarmstenose. (A contribution to benign stenosis of the small intestine.) *Fortschr. a. d. Geb. d. Röntgenstrahlen*, July, 1929, *40*, 58-60.

A case of stenosis of the small intestine resulting from dysentery is described in a woman forty-six years of age, and drawings of the roentgenograms are presented.

The interesting part of the case is that the loop of the ileum adjacent to the stenosis showed an enormous dilatation with a residue lasting as long as five days. Following resection of the involved loop there was healing and a roentgen examination six weeks later revealed normal conditions.—*T. Leucutia.*

Czepa, Alois. Weitere Beiträge zur Röntgendiagnostik der Appendix. (Further contributions to the roentgen diagnosis of the appendix.) *Fortschr. a. d. Geb. d. Röntgenstrahlen*, August, 1929, *40*, 214-241.

A few years ago the author published a detailed article with regard to the roentgen diagnosis of appendicial disease. On the basis of new observations and as a result of contributions by other investigators the subject is reopened.

1. Procedure of examination. A mixture of barium and epsom salts is used for the visualization of the appendix. Citobarium and eubaryt will best serve the purpose. The amount of epsom salts used is individual and depends on the effect produced. If, for example, anamnestic data reveal that a patient has one to three diarrheic stools per day before the examination, two teaspoonfuls of epsom salts is administered, which corresponds to the amount given in the average patient. If, however, the first administration of two teaspoonfuls of epsom salts does not produce the required effect, at subsequent examinations it is increased to three or more teaspoonfuls, until four to five bowel movements per day are obtained.

The purpose of the epsom salts is to increase the bowel activity and thus to produce a filling of the appendix. At least three examinations are necessary before one can safely say that there is non-filling of the appendix. In order to produce a longer sojourn of the barium mixture in the cecal region, normal barium meals are given between the barium-epsom salts mixtures.

The detailed procedure is as follows: If the patient is hospitalized, a barium-epsom salts mixture is adminstered in the morning. This examination, as a rule, includes also a detailed observation of the stomach and duodenum. The same evening a barium meal is given. The second morning the appendix is examined for the first time. If there is filling of the appendix the examination is completed. If the appendix shows no filling or only partial filling (short appendix), a second barium-epsom salts mixture is given (containing the same amount or, if the effect was unsatisfactory, an increased amount of epsom salts). In the evening a second normal barium meal is adminstered. The third morning a second examination of the appendix is made. Should the appendix still show non-filling a third barium-epsom salts mixture is administered and the same evening a third barium meal is given. The fourth morning the appendix is examined for the third time and this examination is declared as final whether there is a filling or a non-filling of the appendix.

If the examination is done at the office, the barium-epsom salts mixture is adminstered at home in the evening and the barium meal is given the following morning, the examinations being carried out always in the afternoon.

If there is a possibility of examining the patient both in the morning and late in the afternoon the observations can be carried out at ten to twelve hour intervals, and thus the entire examination shortened to a period of two days.

In some instances a barium enema completes the examination.

2. The non-filling of the appendix. If following the administration of three barium-epsom salts mixtures the appendix could not be visualized, there is a "non-filling" of the appendix.

The author is of the opinion that every appendix which did not fill is to be declared suspicious of being pathological. Other indirect signs such as pain on pressure in the region of the appendix, certain changes pertaining to the cecum, ileum and ileocecal valve, are in this respect of considerable aid. (*a*) Form changes of the cecum. This may be due to adhesions resulting in abnormal positions of the cecum, lower part of the ascending colon and terminal portion of the ileum. Special attention is called to a peculiar lengthening of the cecal tip observed by the author several times and in 3 cases controlled at post mortem which is always associated with very severe inflammation of the appendix. (*b*) The terminal portion of the ileum. Although a delay of barium in the terminal portion of the ileum is considered by many authors as indicative of a pathological appendix, the author found that this is often the result of a delayed emptying of the stomach due to retention caused by different stomach conditions (such as stenosis, infiltration, etc.). An ileal stasis therefore is not significant of a diseased appendix. (*c*) Cecal stasis. The same may be said of cecal stasis. (*d*) Changes in the stomach, duodenum and gall-bladder. Certain authors claim that affections of the stomach, gall-bladder, kidneys and especially periduodenitic changes often produce appendicial irritation. According to the author's estimation, there is no basis for such an assumption. (*e*) Insufficiency of the ileocecal valve. More recently no significance whatsoever is attributed to the insufficiency of the ileocecal valve. (*f*) Pressure pain in the appendicial region. The pressure pain is of great importance in the case of non-filling of the appendix and indicates a pathological condition. In case of normal filling of the appendix the pressure pain is of no significance.

3. The emptying time of the appendix. A delayed emptying of the appendix does not necessarily mean a pathological condition. It is true that retention in the appendix frequently results in appendicial symptoms. On closer scrutiny, however, one finds that such appendicial retentions and the symptoms resulting therefrom are associated with constipation and that following the administration of cathartics the appendix empties and the symptoms disappear. The author therefore does not agree with Fraenkel that an appendico-stasis which produces irritative symptoms forms an indication for appendectomy and that a prompt healing results from such a procedure.

4. The short appendix. An abnormally short appendix is always suspicious of pathological changes. Four cases with a short appendix are described briefly in which at operation a diagnosis of pathological appendix was confirmed. This, however, does not exclude the possibility of a normal short appendix. The author observed at anatomical section an appendix which was only 3.5 cm. long and which proved entirely normal.

Since the abnormal shortness of a pathological appendix is due in the majority of the cases to an obliteration of the distal portion of the appendix, a demonstration of pressure pain and of changes in position, as well as anamnestic data, are here of great diagnostic significance.

5. The adherent and kinked appendix. Decreased mobility or motility and fixation of the appendix are the characteristics of an adherent appendix, while the form changes indicate a kinked appendix. This latter, however, has to be interpreted with great caution since a roentgenologic visulization of a kinked appendix is often the result of the projection of the appendicial shadow under different angles.

6. Appendix shadow. The different appearances of the filled appendix such as bead form, appendicial concrements, filling defects, and stenosis, indicate different types of appendices, but they do not necessarily mean pathological conditions. If, however, the partial, non-filling of the appendix is constant at several examinations, a severe inflammatory condition or at least abnormal irritative changes may be assumed. The process is somewhat similar to the changes observed in spastic colitis and are as such to be interpreted.

7. Fleeting filling of the appendix. Not infrequently appendices fill very shortly following

the administration of the barium and within ten to twelve hours they show a complete emptying. The meaning of this phenomenon is not as yet clearly understood.—*T. Leucutia.*

Iacobovici, I., Hânganut, M., and Spârchez, T. Consideratiuni asupra unui caz de sindrom a lui Hirschsprung. (A consideration of a case of Hirschsprung's syndrome.) *Clujul med.*, October, 1929, *10*, 475-479.

A case of Hirschsprung's syndrome was observed in a man thirty-eight years of age presenting active symptomatology for a period of two years. The roentgen examination revealed a very marked enlargement of the sigmoid, descending colon and the entire transverse colon with an area of non-filling in the region of the lower portion of the descending colon indicating partial stenosis. At operation it was found that the megalocolon was the result of a strangulation of the ascending colon just above the cecum by a band about 1 cm. in diameter which extended from this point crosswise over the abdominal cavity and, pressing on the lower portion of the descending colon (where the non-filling in the roentgenogram was observed), inserted in the region of the anterior-superior iliac crest. The band was 40 cm. long and at the microscopic examination it proved to be an umbilical cord. Following partial resection of the colon there was complete healing.

In connection with this case, the etiology of Hirschsprung's syndrome is discussed. The following obstacles may lead to the formation of megalocolon: Intestinal kinking occurring at the level of the sigmoid and rectum (especially in men with narrow pelvis), torsion of the colon, valves or folds of the rectal mucosa, spasms due to congenital malformations, congential hyperplasia of the rectal mucosa, neuromuscular disturbances and finally compressive bands of an inflammatory or an embryonic nature.

The case described is exceedingly rare.—*T. Leucutia.*

Gynecology and Obstetrics

Gosset, Ledoux-Lebard and Béclère, Cl. Lipiodiagnostic de l'hydrosalpynx à soupape. (Lipiodol diagnosis of valvular hydrosalpinx.) *Bull. et mém. Soc. de radiol. méd. de France*, January, 1929, *17*, 26-27.

It is a well known fact that the uterine ostium of a hydrosalpinx is permeable in a large majority of cases. This appears paradoxical since hydrosalpinx results from a retention of secretion within the tube indicating that no fluid can pass from the tube into the uterus. One may surmise, therefore, that the uterine ostium of the tube has a valvular action permitting the entry of the fluid from the uterus into the tube but not vice versa.

This valvular action can be used to great advantage in the diagnosis of hydrosalpinx by means of lipiodol. Indeed, the opaque medium injected into the uterine cavity slowly enters the dilated tube and distributes itself in the form of droplets giving a "mulberry appearance." Since there is occlusion of the fimbriated end of the tube none of the opaque medium will enter the abdominal cavity.

Ten cases of valvular hydrosalpinx were observed by the authors. Four of the cases were examined for sterility and the valvular hydrosalpinx was accidentally discovered. In 5 others there was evidence of repeated abdominal pain (in 4 of which the clinical examination was negative for evidence of salpingitis) and in one there was metrorrhagia.

The conclusion is reached that the "mulberry appearance" distribution of the opaque medium within the dilated tube and the absence of the opaque medium (after several days) in the peritoneal cavity are characteristic of valvular hydrosalpinx permitting an early diagnosis in the majority of the cases.—*T. Leucutia.*

Belot, J., Tedesco, and Béclère, Claude. Un cas de réaction salpingienne après injection intra-utérine de lipiodol. (A case of tubal reaction following intrauterine injection of lipiodol.) *Bull. et mém. Soc. de radiol. méd. de France.* February, 1929, *17*, 74-75.

The first incident of tubal reaction was observed in a total of 230 intrauterine injections of lipiodol.

The woman was thirty-two years of age. Six years previously she suffered a severe infection (following pregnancy) which developed into a pelvic peritonitis and which was treated surgically with good results.

Since the patient became sterile a salpingography was done in order to determine the cause of sterility. Four days following the injection of lipiodol the patient started to menstruate and five days later she became ill with fever (39°C.) and signs of tubal infection. The

examination, which at the time of injection showed bilateral hydrosalpinx, now revealed considerable enlargement of the adnexa, with marked pain on palpation. After the administration of three injections of milk the infection rapidly subsided and the patient regained her normal health.

The case is described in order to emphasize the possibility of infection following salpingography. In this particular case two causes might have been responsible for the provocation of the accident: (1) the ancient infection which resulted in a bilateral valvular hydrosalpinx, and (2) the fact that the injection was done within the week preceding the menstruation. It is difficult to say which of the two was the causative factor. The authors incline to believe that the chronic infection which had remained dormant for a period of six years was disturbed at the examination, resulting in exacerbation.—*T. Leucutia.*

GENITOURINARY SYSTEM

TRUCHOT, P. Cancers du rein décelés par la pyelographie. (Cancers of the kidney demonstrated by pyelography.) *Bull. et mém. Soc. de radiol. méd. de France*, February, 1929. *17*, 75-77.

The diagnosis of cancer of the kidney is easy when the lesion is advanced but very difficult when the lesion is in the early stages.

In analyzing the diagnostic signs of carcinomas of the kidney in pyelography the author found the following of more or less importance: (1) deformity of all elements constituting the pelvic image, which is characteristic of large voluminous tumors of the parenchyma or of smaller tumors of the pelvis and calyces; (2) marginal or central lacunar images, which are found in smaller tumors partially involving the lumen of the kidney pelvis; (3) penetration of the opaque medium between the villosities of the tumor, occurring when there is marked necrosis and especially when the cancer is of papillomatous type, and (4) rigidity of the contours of the tumor, demonstrated only in pyeloscopy.—*T. Leucutia.*

NERVOUS SYSTEM

PEIPER, HERBERT. Untersuchungen zu einer Relief diagnostik des erkrankten Rückenmarks und seiner Häute. (Examinations for relief diagnosis of diseases of the spinal cord and its membranes.) *Forschr. a.d.Geb.d.Röntgenstrahlen*, July, 1929, *40*, 1-18.

Myelography has contributed greatly to the roentgenologic diagnosis of spinal cord tumors producing stenosis of the subarachnoid space. The appearance of the iodized oil above the stenosis occasionally even permits a differential diagnosis between spinal cord tumor and adhesive meningitis.

The author belives that relief visualization of the surface of the spinal cord and its membranes in the neighborhood of the pathological process aids in further improving diagnostic accuracy and especially in establishing exact preoperative conditions.

The procedure and technique were already described by the author in a lengthy monograph in 1926. Here it is only mentioned that the patient is placed at an angulation of 30° while taking the roentgenogram so as to permit a greater diffusion of the oil on the surface of the spinal cord above the lesion.

The relief visualization of the spinal cord is important since it permits the exploration of the arachnoid root pockets as well as of the posterior surface of the spinal cord and the anterior surface of the tumor. The author includes numerous drawings and roentgenograms illustrating the diagnostic advantages of the method.

The anatomic relation and the origin of the root pockets of the arachnoidea are discussed and the opinion is expressed that the passage of the spinal fluid through these root pockets from above downwards, and vice versa, is possible since they form a sort of a separate canal from the rest of the subarachnoid space. The entrance of the iodized oil into the intact root pockets is possible either through the cisterna or through the fluid space around the cauda.

If there is a compression of the subarachnoid space either by a tumor or a pathological process the injected iodized oil may enter the root pockets, thus forming an irregular longitudinal line running on one or both sides of the spinal cord. This is, according to the author, nothing else than a myelographic relief of the spinal cord and is due to the fact that the rigidity of the anterior and posterior roots of the nerves prevents a collapse of the pockets between these roots no matter how pronounced the compression of the rest of the spinal cord may be.

The longitudinal line which is variously called "ligne festonée," "girlandenband," etc., is considered by the majority of investigators as pathognomonic of intramedullary tumors, but the author found it to exist also in extramedullary tumors and in certain instances where the collapse of the subarachnoid space is due to drainage of the cerebrospinal fluid, as for example, in 2 cases of fractures of the arch of the vertebrae and in one case where a lumbar puncture was performed just previous to myelography.

If the root pockets are visualized on both sides, one might estimate the thickness of the spinal cord in the affected region. Certain investigators (Laasch and Denk) were of the opinion that this might indicate the degree of swelling of the tissues due to pressure of the tumor on the spinal cord. The author, however, thinks that the sign is of value only if demonstrated in connection with other myelographic signs of spinal cord tumor and if the site of the swelling coincides with the site of the obstruction as demonstrated by the arrest of the iodized oil.

The relief visualization of the surface of the spinal cord or of the tumor itself (by taking the films with the patient at an angulation of 30° above the horizontal) may be of aid in demonstrating the typographic conditions around the tumor, especially with regard to the enormous dilatation of the blood vessels as in certain types of angiomas (angioma racemosum), or when the tumor extends over a very large surface as, for example, in a malignant hemangiocavernoma.

Three cases of angioma racemosum are known in the literature in which diagnosis was made with the aid of myelography. One case was reported by the author in 1925, another by Perthes in 1927, and a third by Alajouanine and Guillain in 1925. In the one case of malignant hemangiocavernoma observed by the author the tumor extended over a length of 18 cm.

The conclusion is reached that the relief visualization of the spinal cord and its membranes is of considerable diagnostic importance in certain lesions of the spinal cord. It remains for the future to add new contributions to the method and thus to make it of a real practical value.—*T. Leucutia.*

Skeletal System

Kemkes, B. Über familiär auftretende Störungen des Knochenwachstums im Röntgenbilde. (On familial disturbances of the bony growth as shown in the roentgenogram.) *Fortschr.a.d. Geb. d. Röntgenstrahlen*, July, 1929, *40*, 90-98.

In 1914 Goetzky and Weihe described a case of myxedema with transverse striations of the bones near the epiphyseal endings. The condition was characterized as a periodic growth inhibition of the bone due to periodic functional disturbances of the thyroid gland.

The author recently observed a similar case in a girl five years of age, and on further inquiry found that four brothers and sisters of the patient, the ages of whom varied between six months and seven years, showed practically identical conditions.

Four of the five cases described have been submitted to phosphorus-cod liver oil treatment on account of rickets, and the first impression was that the striations or rings of growth disturbance of the bones might have been due to the phosphorus treatment. Such occurrences were first described by Wegner in 1872, and more recently roentgenologically demonstrated by Brandes. A closer scrutiny, however, revealed that the number of periods of the phosphorus treatment do not entirely coincide with the number of the striations or rings appearing on the bones. Moreover, the youngest child who is only six months of age did not receive phosphorus treatment and still the roentgenograms reveal the appearance of striations and rings of the bones. It appears, therefore, that some other factor than the phosphorus treatment must be the underlying cause.

In connection with this the etiology of the different growth disturbances of the bones is discussed (effect of acute infections, Looser's "remission lines" in late rickets and osteomalacia, Möller-Barlow's disease, congenital lues, myxedema, etc.), and the conclusion is reached that since practically all of the children have shown signs of functional disturbance of the thyroid gland, the bone disturbances must be of endocrine origin due to periodic hyperfunction of the thyroid gland. The familial occurrence of such disturbances has been demonstrated for the first time.—*T. Leucutia.*

Fitchet, Seth M. Cleidocranial dysostosis: hereditary and familial. *J. Bone & Joint Surg.*, Oct., 1929, *11*, 838-866.

The syndrome, "cleidocranial dysostosis,"

Fitchet states is a relatively rare condition. It was described and named by Marie and Sainton in 1897. Fitchet carefully reviews the literature reporting the salient features of previous cases and adds reports of 5 more patients, all members of the same family. Abram states that the leading features of the syndrome are: (1) aplasia more or less marked, of the clavicles; (2) exaggerated development of the transverse diameter of the cranium; (3) delay in the ossification of the fontanelles, and (4) hereditary transmission.

Fitchet quotes a report (King, 1899) of 2 cases, children, having developmental defects in the clavicles, whose mother was said to have an united fracture of the right clavicle, caused by an accident in her childhood. The older of the children a girl, is now forty-six years old, is single and is living and well. The younger, a boy, is now thirty-eight years old, is living and well and is the father of 4 children. Fitchet has examined and studied these 6 individuals. Of the 4 children, 3 show bilateral defects in the clavicles. He has also had the opportunity of studying 2 other patients, both of whom showed defects in the clavicles, but were not of the same family.

The various theories of the cause of this syndrome are fully discussed. Rickets as a causative factor has been mentioned. Cases where there are no clavicles and no scapulae should be grouped in the class of true aplasias rather than in the class of dysostotics. Fitchet believes that nothing whatever is known of the etiology of this condition of the clavicles. Sex frequency is about equal in the reported cases. It may be transmitted by either father or mother to either sons or daughters, and there are several cases which have no familial or hereditary tendency whatever. Steindler believes it may be placed in the class of systemic intrinsic deformities, the cause of which lies in early developmental aberration reaching back into the first weeks of embryonal life. It is evident that there are two distinct classes or types of cleidocranial dysostosis. In one group may be placed those which show a familial, hereditary deformity of the clavicles, with or without other anomalies. In the second group are those cases which show a non-hereditary, non-familial, congenital deformity of the clavicle or clavicles, with or without other anomalies. It will thus be seen that there are probably less than a dozen reported families which can be identified as hereditary defects,—defects transmitted to an offspring. And there is a still smaller group that fulfill the criteria of Marie and Sainton.

The paper is well illustrated with roentgenograms showing the defects in the clavicles of the several patients.—*R. S. Bromer.*

ZUKSCHWERDT, L. Processus supracondyloideus humeri and foramen supracondyloideum. *Fortschr. a. d. Geb. d. Röntgenstrahlen*, July, 1929, *40*, 79.

A peculiar spur formation leading to an almost complete foramen of the medial aspect of the lower humerus just above the elbow is briefly described. The condition is called processus supracondyloideus or foramen supracondyloideum. According to Bluntschli, it is an atavistic manifestation. In many mammals and reptilia it still forms a regular part of the skeleton and is called processus entepicondyloideus.

The condition is described because of its rarity. It produces no symptoms whatsoever. —*T. Leucutia.*

ROTHBART, LADISLAUS. 1. Fractura manubrii sterni. 2. Sinus "alveolaris." *Fortschr. a. d. Geb. d. Röntgenstrahlen*, July, 1929, *40*, 89-90.

Two cases are briefly described. The first case is that of a woman forty-two years of age who suffered a fracture of the manubrium of the sternum. The roentgenogram is presented and briefly discussed.

The second case is that of a patient nineteen years of age who presented a peculiar cystic appearance of the maxilla in the region of the roots of the fourth to sixth teeth. The condition is characterized and described as sinus alveolaris.—*T. Leucutia.*

DANDY, WALTER E. Loose cartilage from intervertebral disk simulating tumor of the spinal cord. *Arch. Surg.*, Oct., 1929, *19*, 660-672.

Dandy reports two cases in which slight repeated trauma caused a displacement of a fragment of an intervertebral disc. These fragments bulged into the spinal canal as a tumor. The tumor was composed of the cartilage and the fluid formed by reaction to the foreign body.

Both of these cases occurred in men during the latter half of life and they were seen within a

few months of each other. This fact makes the author believe that the condition may be more frequent than diagnosed heretofore. Both of these displacements of the cartilage occurred in the mid-lumbar region and the symptoms were those of localized vertebral pain plus bilateral sciatica, one side being more affected than the other. Later the symptoms are rapidly increasing paralysis, sensory and motor, and loss of urinary and vesical control and of reflexes, all due to compression of the cauda equina. A preoperative diagnosis of carcinoma was made in both cases. The lesion is undoubtedly of traumatic origin and is completely cured by operative removal. These findings may offer a pathologic basis for cases of so-called sciatica especially the bilateral type.—*E. P. Pendergrass.*

Polgár, Franz. Ueber interarkuelle Wirbelverkalkung. (On interarcual calcifications of the vertebrae.) *Fortschr. a. d. Geb. d. Röntgenstrahlen*, August, 1929, *40*, 292-298.

The roentgen appearance of the interarcual calcifications of the vertebrae are described and illustrated by several roentgenograms in both anteroposterior and lateral views. As indicated by the name, the interarcual calcifications occur on the posterior aspect of the vertebrae near the arches. True interarcual bony bridges result from the calcification of the ligmenta interarcualia often leading to a narrowing of the intervertebral spaces in the anteroposterior view. In rarer instances osseous bands originating from the perichondral calcification of the posterior portion of the intervertebral discs protrude into the interarcual space, thus causing a narrowing of the intervertebral foramina in the lateral view.—*T. Leucutia.*

Schmorl, G. Verkalkung der Bandscheiben der Wirbelsäule nebst Bemerkungen über das Verhalten der Bandscheiben bei infektiöser Spondylitis. (Calcification of the vertebral discs with a consideration of the appearance of the discs in infectious spondylitis.) *Fortschr. a. d. Geb. d. Röntgenstrahlen*, July, 1929, *40*, 18-26.

Small irregular circumscribed calcified foci are observed in vertebral discs rather frequently (spondylitis deformans).

Large calcified foci in the region of the nucleus, however, are rare. Such calcifications are localized, as a rule, only to one, or less frequently, to two or three discs and they are encountered chiefly in the mid-dorsal region.

The large calcifications of the discs represent a degenerative process and apparently general constitutional diseases have no effect on the lesion, at least the author was unable to demonstrate dependence of the degeneration of the nucleus on a generalized constitutional disease.

The appearance of the discs in infectious spondylitis was analyzed and it was found that practically all infectious conditions (typhoid, angina, grippe, lymphogranulomatosis, etc.) which involve the vertebral bodies leave the cartilage plates intact. The only case in which the photomicrographs revealed involvement of the cartilage plates was that of a spondylitis of the twelfth dorsal vertebra following grippe. A rather extensive destruction of the disc, however, occurs in purulent osteomyelitis, whether it be localized to one or several vertebrae.

In conclusion, the author expresses the conviction that infectious spondylitis involves the cartilage plates only rarely.—*T. Leucutia.*

Blount, Walter P. Hodgkin's disease; an orthopaedic problem. *J. Bone & Joint Surg.*, Oct., 1929, *11*, 761-770.

Blount states that the puzzling clinical picture which was first described by Hodgkin in 1832, and since then studied and clarified by many medical men and pathologists, has recently been recognized as one of the problems confronting the bone surgeons. In the exhaustive investigation of cases, the osseous system was at first only casually examined. Hyperplasia and degeneration of the bone marrow and thinning of the cortex were noted as a part of the hemopoietic involvement. Cases have been reported in which the spine was involved with findings and symptons somewhat suggestive of tuberculosis. In some cases the roentgen-ray examination has shown a generalized periostitis in addition to the medullary involvement. Osteoperiosteal tumors of the cervical spine and right tibia, transverse myelitis due to involvement of several vertebrae, and enlargement of one rib due to new bone formation, have also been reported.

In the case reported by Blount in this paper, the bone involvement preceded the lymph gland enlargement by two years, and interesting errors in diagnosis were made because of the

absence of the usual symptons. Illustrations of the roentgenograms of the lesions of the spine and the head of the humerus are shown. The lesion in the spine was suggestive of tuberculosis, but destruction of the vertebal bodies was present with preservation of the vertebral discs. Slides from tissue removed at time of biopsy of the humeral lesion were studied by several pathologists and no definite diagnosis was made because of the peculiar nature of the tumor. Later tumors developed in the scalp and in the thyroid and the posterior chains of cervical glands were diffusely enlarged. The final post-mortem findings were those of a proliferative type or lymphosarcomatous type of Hodgkin's disease.

The author's summary follows: (1) Skeletal involvement in Hodgkin's disease is much more common than has been realized and may be primary. (2) Bone changes vary from degeneration of the bone marrow to bone destruction and production. (3) Hodgkin's disease may simulate tuberculosis of the spine and bone tumors. (4) Deep roentgen therapy is of benefit in retarding the progress of the disease. —*R. S. Bromer.*

SPURRIER, ETHELBERT. Joint sequestra of osteo-myelitis. *J. Bone & Joint Surg.*, Oct., 1929, *11*, 747-753.

The author quotes Phemister's work on the recognition of dead bone based on pathological and roentgenological studies. Phemister called attention to the fact that a sequestrum bordering on joint cartilage in the presence of a complicating suppurative arthritis stands out prominently because of the preservation of its original density and because the bone supporting the articular cartilage, due to its inaccessibility to granulations, is not broken down, whereas the bone underlying the rest of the cartilage in the infected joint is usually irregularly broken down by granulations. Spurrier further considers this type of sequestrum because it has distinctive pathological and roentgenological appearances, and because it has not been adequately discussed in the extensive literature on osteomyelitis in recent years.

His summary follows:

"When bone bordering on an articular surface becomes necrotic in osteomyelitis, it separates as a sequestrum which has the following characteristics:

"1. It is denser than the adjacent living bone which undergoes atrophy.

"2. Its articular cartilage disappears, being digested by the proteolytic ferments liberated in the joint.

"3. The articular cortex of the sequestrum is preserved because of its inacessibility to granulation tissues.

"4. The articular cartilage and cortex of the rest of the joint, which is living, is usually lost. This gives the joint sequestrum a characteristic appearance which is easily recognizable in the roentgenogram as well as in the gross specimen."—*R. S. Bromer.*

MOUCHET, ALBERT. Ostéochondrite de la hanche. (Osteochondritis of the hip.) *Presse méd.*, Oct. 26, 1929, *37*, 1399-1400.

A case of osteochondritis of the hip occurring in a boy nine years of age is briefly described, and in connection with this, the clinical aspect and the roentgenologic appearance of the condition are discussed.

Clinically there is a gradually developing limp with limitation of the function in the hip joint.

Roentgenologically there is a change of the upper end of the femur consisting in a flattening of the head and thickening of the neck. The articular space is increased and occasionally there is slight alteration of the cotyloid cavity.

The treatment consists in rest and immobilization in continuous extension for at least six months or longer.

The opinion is expressed that osteochondritis of the hip is an affection not altogether rare and that the roentgenological appearance in the majority of cases allows an easy diagnosis. —*T. Leucutia.*

PHEMISTER, D. B. Chronic fibrous osteomyelitis. *Ann Surg.*, Oct., 1929, *90*, 756-764.

Chronic fibrous osteomyelitis is a term applied to any long standing pyogenic infection in which the reaction on the part of the fibroblasts in contrast with the infiltrative cells becomes the outstanding feature of the lesion. It pursues a chronic course in which a circumscribed area of bone is broken down by fibroblastic activity and the space is filled with soft tissue. By the time the lesion comes to operation it is devoid of the usual microscopic changes of pyogenic infection and bears much

resemblance to benign giant cell tumor and osteitis fibrosa cystica with which it is sometimes confused. The author has studied 11 cases from a pathological standpoint. The findings vary with the age of the lesion.

The findings in early progressive lesions show the cavity to be filled with a soft tissue that is grayish to brown in color, which consists of fibroblasts, capillaries, polyblasts, giant cells, old hemorrhage and blood pigment with some necrosis. There is lacunar absorption about the walls of the cavity and the adjacent haversian canals are dilated as a result of absorption by newly formed fibrous tissue. The response on the part of the bone is extremely variable; in some the new bone formation is slight; in others marked. There is practically no leucocytic or lymphocytic infiltration to be seen. After a progressive period which may extend over a number of months the disease may come to a stand-still in which event a cortex is laid down about the lesion and the cavity becomes filled with a mature connective tissue that is free from giant cells and pigment. This connective tissue may remain unossified or there may be fine bony trabeculae laid down throughout. There may be very few or no symptoms.

The eleven cases are beautifully illustrated. He discusses the causes of such lesions and differs from Konjetzny, Looser and Axhausen, in that he feels that these lesions represent a pyogenic infection of low virulence.—*E. P. Pendergrass.*

Hirsch, Edwin F., and Ryerson, Edwin W. Necrosis of the distal epiphysis of the right femur. *J. Am. M. Ass.*, Aug. 31, 1929, *93*, 679-684.

Certain chronic diseases of joints causing protracted, mild but increasing disability and atypical clinical symptoms are now recognized as being due primarily to epiphyseal necrosis, usually one of the bones articulating in the affected joint. Axhausen recently reported that his experience with these lesions led him to believe that they were bland anemic infarcts of the bone caused by mycotic embolic vascular occlusions. The organisms in these emboli are rapidly destroyed by the tissues or never gain a foothold.

The author reports one case, the outstanding features of which were insiduous onset of the disease in the lower end of the femur accompanied by an inflammatory reaction of the soft tissues. The roentgenorgram of the knee made eleven years after the onset showed a large rarefied area in the internal condyle of the femur. The patient was operated upon and the necrotic bone and myxomatous connective tissue was removed from the affected part. A fusion operation was done and patient was well two years later. A historical review of similar cases reported by Axhausen, Köhler, Kienböck and others is included in the report.—*Karl Kornblum.*

Bauer, Julius, and Kienböck, Robert. Zur Kenntnis der Knochen- und Gelenksveränderungen bei Alkaptonurie. Osteoarthrosis alcaptonurica (ochronotica). (On the knowledge of the bone and joint changes in alcaptonuria. Osteoarthrosis alcaptonurica (ochronotica).) *Fortschr. a. d. Geb. d. Röntgenstrahlen*, July, 1929, *40*, 32-42.

The chronic deforming joint affections, the so-called arthritis (arthrosis) deformans ochronotica, occurring in connection with alcaptonuria were described by Virchow in 1866 and have been repeatedly studied since. Very little is known, however, about the bone changes accompanying alcaptonuria.

The authors describe a case of alcaptonuria in a man fifty-four years of age who came under their observation in 1928 for a decompensated heart condition. Inquiry into the history of the case revealed that ever since birth the urine has turned very dark when exposed to air. At the age of forty-four the patient noticed a brownish discoloration of the sclera and a dirty gray-greenish discoloration of the ears. Five years later pigmentation of the face appeared which became very pronounced when exposed to the sun. For the last three years the patient has complained of rheumatism with pain in the ankles, knees, elbows and back. He could walk only with the aid of a stick.

The clinical examination showed a typical case of alcaptonuria. The roentgen examination of the shoulder, spine, knee, ankles and both femora (roentgenograms of which are presented) revealed marked changes of the joints and joint-forming bones consisting of atrophy and hypertrophy, as well as of cystic formations and marginal bone deposits with separation of bony fragments, and with a more or less diffuse thickening of the bony structures.

The changes in the shafts of the bones manifested themselves in the presence of numerous, small, rounded, superficial foci of lessened calcium deposits (defects) which were especially marked on the femora. The lesions of the spine consisted in thinning of the discs with more or less diffuse thickening of the vertebral bodies and rather extensive marginal new bone deposits.

Differential diagnosis includes arthritis deformans (osteoarthrosis deformans simplex), gout, hemophilic joints and the hypertrophic form of tabetic arthropathy. Clinically a confusion with diabetes (reduction of alkaline copper oxide solution of the urine), and different conditions leading to a pigmentation of the skin (Addison's disease, argyrosis, arsenmelanosis, hemochromatosis, etc.) and in very rare cases with nevi and melanosarcoma is possible.

The disease is, according to Garrods, an "inborn error of metabolism" and consequently the treatment consists in a protein therapy. Interesting in this respect is the observation of Baar and Freud who, following two injections of cow serum and cow milk in a child ten months old suffering from alcaptonuria, observed the almost complete disappearance of homogentisic acid within twenty-four hours after the injection, lasting for a period of two to three days. The authors observed the same effect with the cow serum but the milk injections which always led to high elevation of temperature remained without influence on the elimination of homogentisic acid. Their patient later contracted erysipelas and died. The high temperatures occurring during the erysipelas also remained without influence on the quantitative elimination of the homogentisic acid.

It is recommended that for prophylaxis a diet poor in proteins containing aromatic amino acids be prescribed and that the joint affections be treated the same as any other chronic joint disease.—*T. Leucutia.*

KIDNER, FREDERICK C., The prehallux (accessory scaphoid) in its relation to flat-foot. *J. Bone & Joint Surg.*, Oct., 1929, *11*, 831-837.

The prehallux is a supernumerary bone which occasionally appears in the human foot, attached to or fused with the inner border of the scaphoid. It is usually described as lying somewhat behind and below the scaphoid, but in Kidner's experience he has found it directly internal to the scaphoid as described by Dwight. When it is present, the tendon of the tibialis posticus, on its way to its final insertion in the internal cuneiform and metatarsals, attaches to it, instead of to the under surface of the scaphoid tubercle.

The origin of the bone is undoubtedly evolutionary. It appears in many of the lower mammals in a greater or less degree of development, and with a greater or less degree of functional importance. Monahan in 1920, suggested two possible theories to explain its presence: first, and most probable, that it is a direct evolutionary descendant of the prehallux or sixth toe, in such lower vertebrates as the echidna and opossum; second, that it is a progressive evolutionary effort of nature to reenforce a weakening and pronating foot arch. Kidner believes that Monahan's theory that it is dependent for its appearance on chronic disease is unquestionably wrong. The bone, contrary to Monahan's statement, does appear before adult life. Dwight states that it is really congenital and is recognized in the fetus.

Since the advent of the roentgen ray the prehallux has been recognized during life with increasing frequency. Some authors lay emphasis on its relation to an everted or flat foot. A second group emphasize painful conditions occurring at the site of the prehallux, either as inflammatory reaction or as the results of continued trauma on an abnormal bony prominence or abnormal joint. Haglund spoke of a peculiar tarsalgia due to the irritating pressure of the bone. A condition resembling Köhler's disease has been described.

From Kidner's clinical observations he has evolved a theory to explain the relation between flat-foot and the prehallux. First, the attachment of tibialis posticus tendon being displaced upward and inward, the line of its pull is changed. Instead of pulling directly upward, as it does when attached to the lower surface of the scaphoid, it is forced to pull backward and inward at an angle and becomes an adductor instead of a supinator. This of course, makes it work at a mechanical disadvantage and it must work harder to accomplish an equal lift on the tarsus. Second, the long lever arm of the prehallux, extending inward, forces the muscles to greater lineal contraction in order to produce a given amount of lift at the center of the arch.

In other words, the lifting effect of the arch is reduced: first, by the angulation of the line of pull; and second, by the longer distance through which the pull must act. Third, the effort to lift the arch or to adduct the foot is very quickly stopped by the close approach of the prehallux to the internal malleolus. This approach produces an insuperable mechanical obstacle. Fourth, the crowding of the tissues between the prehallux and the internal malleolus leads to discomfort which is automatically relieved by abduction. These last two points of his theory, he believes, explain the improvement in flat-foot which he has seen, and which others notably Froelich, have observed, after simple removal of the prehallux.

Kidner describes his method of operative removal which he believes is original and states that his results have been uniformly successful. From the roentgenological point of view his article is of interest in that it emphasizes the fact that a careful search for prehallux should be made in all cases of flat-foot. The discovery of the presence of the prehallux should not be regarded as the mere occurrence of a supernumerary bone of the foot which has no clinical significance.—*R. S. Bromer.*

Weiss, Konrad. Über die "Malazie" des os naviculare pedis. (On "malacia" of the os naviculare pedis.) *Fortschr. a. d. Geb. d. Röntgenstrählen*, July, 1929, *40*, 63-67.

In 1927 Müller published a case with bilateral change of the os naviculare pedis in an adult, a condition which he classified as a malacia and which he considered similar to Köhler's disease in children.

The author observed a similar condition in 1925 in a case, a man fifty-eight years of age, and one year later in a second case, a woman forty-six years of age. The two cases are described in detail and illustrated with roentgenograms.

The author expresses the opinion that the changes observed in his cases, as well as in the case of Müller, are similar to the malacia of the os lunatum manus described by Kienböck. He also admits that theoretically there is a similarity between this condition and Köhler's disease of the os naviculare in children, though the course and outcome of the two conditions are entirely different.—*T. Leucutia.*

ROENTGEN AND RADIUM THERAPY

Fuhs, Herbert, and Konrad, Josef. Über weitere Indikationen für die Buckystrahlen in der Dermatologie. (On further indications for the Bucky rays in dermatology.) *Strahlentherapie*, 1929, *33*, 479-497.

Twelve unusual cases are described (some with report of microscopic findings at different intervals following the irradiation) in which the application of the Bucky rays led to remarkable results.

(1) Morbus Darier (1 case) in which 2000 R was given twice at four weeks' intervals, the quality of the rays expressed in aluminum half-value layer being 0.0292 mm.

(2) Ichthyosis atypica palmaris (1 case); 320 R, half-value layer 0.34 mm. cellon; one single treatment.

(3) Pityriasis lichenoides chronica (3 cases); 1200 R to 1500 R, half-value layer 0.0292 mm. Al.

(4) Pityriasis varioliformis acuta (1 case); 160 R, half-value layer 0.34 mm. cellon.

(5) Poikilodermia vascularis (Jakobi) (1 case); 600, 1200, 1800 R, half-value layer 0.0292 mm. Al. The best results were obtained with 1200 R which is to be considered as the average dose.

(6) Spiegler's tumor (3 cases); 300, 600, 1200 R, half-value layer 0.34 mm. cellon, repeated at two to three weeks' intervals for two to three series. The best average dose corresponded to 1200 R.

(7) Nicolas-Durand-Favre's disease (2 cases); 2000 R, half-value layer 0.0292 mm. Al.

The reason why in some instances aluminum and in others cellon was used for the determination of the half-value layer is because the treatments were carried out on two different apparatus, one being stabilized for aluminum and the other for cellon.

In all instances a rather rapid improvement was observed immediately following the application of the roentgen rays and healing ensued within a few weeks. In the case of morbus Darier doses as high as 4500 R were administered for experimental purposes and it was found that no serious injury resulted to the skin. In the case of poikilodermia even a return of the elastic fibers of the skin was observed. It appears thus that Bucky rays are entirely harm-

less to the skin even when applied in large doses. —*T. Leucutia.*

GROSGLIK, ADAM. Hauterscheinungen im Verlaufe einer chronischen myeloischen Leukämie entstanden unter dem Einfluss der Röntgenstrahlen. (Skin manifestations observed in the course of chronic myeloid leucemia as a result of roentgen applications.) *Strahlentherapie*, 1929, *33*, 498-514.

A regular appearance of skin eruptions was observed in a case of myeloid leucemia following irradiation over the spleen or the lymph nodes for therapeutic purposes. The case, that of a man twenty-nine years of age, is described in detail. The skin manifestations were of the urticaria type, and from this and the fact that they appeared at regular intervals and with gradually decreasing intensity following each irradiation, the author concludes that the process must be due to anaphylaxis. In reviewing the literature it was found that 2 similar cases were described, one by Jörgen Schaumann and the second by Justus.

While most investigators, and especially Blaschko and Pinkus, are of the opinion that the skin manifestations in leucemia are due to a primary toxicosis brought about by the effect of the tumor detritus, the author believes that they are rather the result of secondary intoxications on an anaphylactic basis. According to this theory the antigen does not even have to be toxic. Yet, a more or less generalized skin eruption may result from the decomposition products of the antigen which might possess a highly toxic effect.

The reason why anaphylaxis is not observed more frequently in blood diseases and malignant tumors is due to the fact that anaphylaxis is a very rare occurrence. Alexandrescu and Ciuca, for example, in 70,000 cattle vaccinated against carbuncle found anaphylactic manifestations in only 10 per cent.

The reason why anaphylaxis does not occur more often following roentgen therapy is, on the other hand, explained by the fact that in most instances roentgen therapy is not started until in the later stage of the disease and were there a tendency toward anaphylactic manifestations this would have occurred already. For the same reason skin manifestations are observed very rarely in recurrent conditions. —*T. Leucutia.*

FREUND, LEOPOLD. The x-ray treatment of wounds. *Brit. M. J.*, Sept. 7, 1929, *2*, 449-450.

As long ago as 1898, Freund states he noticed the beneficial effect of roentgen rays on keloids and bad scars. In a later histological experiment on a very large keloidal scar, he observed that the hyperplasia of the connective tissue arose from the numerous young round cells and spindle cells clustered around blood vessels. The idea occurred to him that it might be possible to prevent the formation of keloid by exposing to the influence of the roentgen rays, those groups of cells which on account of their youth are particularly sensitive. Since then after the complete excision of tumors in a number of people who showed a tendency to keloid formation, instead of stitching up the wounds or covering them with skin grafts, he has administered small doses of roentgen rays to the open wounds, the bleeding of which has been stopped. The roentgen-ray dose was administered immediately and repeated on several successive days. As a consequence, he has not hesitated to use this method in other pathological conditions which he considered suitable.

The following conditions have been treated: circumscribed patches of lupus vulgaris, epitheliomata, rodent ulcers, keloids and pigmented nevi. When these pathological masses are excised the roentgen rays do not have to destroy these tissues. These would offer resistance to the rays and weaken them on their passage to the base of the lesion. Thus the use of roentgen rays after operation on the open wound renders the operation more effective. If, in spite of excision, some traces of the lesion are left in the wound, they will be attacked more intensively than when the wound is stitched up. If in spite of this method of treatment, the lesion recurs in a circumscribed fashion, this can be again treated in the same manner. The thin delicate scar left by this method of treatment offers only a slight resistance to the breaking through of the new growth to the outside. This constitutes a very important advantage over large wounds which have been stitched or grafted. Such wounds are often so hard and thick and edematous that they offer insuperable obstacles to the breaking through of the infiltration which is growing beneath them, and consequently takes the line of least resistance and spreads beneath the scar. In other words, a thick scar encourages

the propagation of the disease in the body of the patient.

The cosmetic results are excellent. The method offers, in addition, in lupus vulgaris and malignant processes, the great advantage of shortening considerably the duration of treatment, especially that of the required roentgen-ray treatment. The application of the method has its limits, depending on the localization and the extent of the lesion; within these limits there still remains a wide scope for fruitful work. Wounds in situations where the skin remains stretched are the most suitable for the method. Even a very extensive wound following excision is not an obstacle to the formation of a good scar. According to Freund's experience the duration of healing of wounds after roentgen-ray treatment is certainly not longer than it would be without their use. As a result of experiments he believes, in animals, a fresh wound subjected to roentgen treatment (therapeutic dosage), was healed a little earlier than a wound not so treated of exactly the same area and depth, symmetrically situated in the same animal.

The dose Freund uses is usually a little higher than an epilation dose, about 6 to 7 H. It is distributed over six or seven sittings, which take place at intervals of two or three days. It would appear that unfiltered rays of 6 to 7 H. hardness are more efficient than strongly filtered hard rays.

Cases where the lesion is situated in folds or angles of the skin are not suitable for Freund's method. Very extensive lesions are also unsuitable. He does not believe that the use of roentgen rays over the field of operation, previous to the actual surgical operation are beneficial. He quotes Sparmann who states that in Malays, who have a strong tendency to excessive hyperplasia of the connective tissue, and who are liable to keloid formation, the prophylactic use of roentgen rays before the operation, or their use after the removal of the stitches, when of course the wound is no longer open, is very often useless.—*R. S. Bromer.*

Delherm, L., and Beau, H. Note sur la radiothérapie dans le traitement de l'artérite oblitérante. (Note on radiotherapy in the treatment of arteritis obliterans.) *Bull. et mém. Soc. de radiol. méd. de France*, January, 1929, *17*, 32-34.

Three cases of arteritis obliterans treated by roentgen therapy are described in detail. In one case there was a remarkable result, the healing lasting now for a period of over nine months, while in the other 2 cases there was no improvement.

The one case healed was treated as follows: First seven applications of infra-red rays were given, but without effect. Then eighteen applications of diathermy (from February 9, 1927 to April 8, 1927) were made, with very slight improvement. Finally, roentgen therapy was started (in April, 1927). This consisted in the use of four ports of entry (2 dorsolumbar and 2 lumbosacral), 25 cm. spark gap, 25 cm. skin target distance, 5 mm. Al, 300 R per sitting, one sitting weekly, 900 R per port of entry, one series consisting of twelve sittings. During the same time diathermy was continued up to 29 applications. In October, 1927 and in February 1928, the roentgen therapy was repeated (second and third series).

The opinion is expressed that the effect of the roentgen rays was through the sympathetic system.—*T. Leucutia.*

Desplats and Langeron. Action favorable de l'irradiation de la région surrénale dans les artérites oblitérantes. (Favorable action of irradiation of the suprarenal region in arteritis obliterans.) *Bull. et mém. Soc. de radiol. méd. de France*, January, 1929, *17*, 34-40.

Three cases of arteritis obliterans are briefly described in which irradiation of the suprarenal region resulted in marked improvement.

The technique of irradiation was as follows: 130,000 volts, 10 mm. Al, 30 cm. skin target distance, one field of entry to each side of the spine centered over the suprarenals, 1200 to 2000 R over each field, the dose being divided into four fractions given on consecutive days.

The opinion is expressed that although the irradiation is made through the suprarenals the action must be through the intermediary of the sympathetic nervous system.—*T. Leucutia.*

Gouin, J., and Bienvenue, A. Au sujet de la radiothérapie dans le traitement de l'artérite oblitérante et de l'action favorable de l'irradiation de la région surrénale dans les artérites oblitérantes. (On the subject of radiotherapy in the treatment of arteritis obliterans and the favorable action of the irradiation of

the suprarenal region in arteritis obliterans.) *Bull. et mém. Soc. de radiol. méd. de France*, February, 1929, *17*, 57-65.

Delherm and Beau, and Desplats and Langeron (see above abstracts), in treating arteritis obliterans by means of roentgen rays, expressed the opinion that the action is through the intermediary of the sympathetic system. The authors wish to call attention to the fact that they had previously noted the possible effect of the roentgen rays on the sympathetic system in 1924, in connection with the roentgen treatment of a case of lichen planus.

It was, and still is the custom of the authors to irradiate the region of the fourth dorsal, which they call the principal cutaneous zone, for the treatment of various skin conditions. In case of failure, the region of the twelfth dorsal to second lumbar, the so-called "accessory cutaneous zone," is irradiated. The improvement obtained in various dermatoses by the irradiation of these zones can be explained only by the effect of the roentgen rays on the sympathetic system.

With this as an incentive, the authors investigated the effect of the irradiation on the sympathetic system (especially through the lower dorsal and lumbar region) in other conditions than dermatoses. Later following the principle of Leriche's functional sympathetic surgery, they extended the irradiation also to the regional vasculo-nervous bifurcations (carotid region, axilla, cubital region, triangle of Scarpa, popliteal region, etc.) and to the vascular endocrine glands (especially suprarenal).

The results obtained were similar to those of the functional sympathetic surgery.

Thus the irradiation of the sympathetic system, as a whole, may be divided into the following groups: (1) Local sympathetic roentgen therapy. Distant cutaneous effects. (2) Axial (spinal) roentgen therapy, functional sympathetic (non-filtered). General cutaneous effects (3) Axial (spinal) roentgen therapy, functional sympathetic (filtered). Cutaneous and splanchnic effects depending on the zones irradiated and the quality of the roentgen rays used. (4) Regional roentgen therapy, functional sympathetic (vasculo-nervous bifurcations). Cutaneous trophic effects. Splanchnic effects only rarely. (5) Glandular sympathetic roentgen therapy. Mono- or pluriglandular splanchnic effects with general effects.

According to this classification the irradiation of the suprarenals in arteritis obliterans, for example, represents a glandular sympathetic roentgen therapy which is part of the functional sympathetic roentgen therapy.

The chief requirement of the success of roentgen therapy of the sympathetic system is that it be carried out with moderate doses and penetrations.—*T. Leucutia.*

MONIER-VINARD, DELHERM, and BEAU. La radiothérapie dans la maladie de Raynaud. (Radiotherapy of Raynaud's disease.) *Bull. et mém. Soc. de radiol. méd. de France*, February, 1929, *17*, 69-73.

Seven cases of Raynaud's disease were treated and improved by roentgen therapy.

As is known, there are two theories for the pathogenesis of Raynaud's disease: (1) the vascular theory, according to which the primary cause of the lesion is in the alteration of the blood vessels, and (2) the theory of nervous origin, according to which the vascular changes observed are secondary to alterations of the sympathetic nervous system. While diathermy, infra-red rays and light baths, and acetylcholin, act directly on the vascular system (vasodilatation), the effect of the roentgen rays is through the sympathetic system.

The technique consists in the irradiation of the cervicodorsal spine down to the second dorsal vertebra, the inferior cervical ganglion being included), or of the lumbar spine (from the tenth dorsal to the fifth lumbar vertebra, the lumbar paravertebral ganglions being included) according to whether the lesion is localized to the upper or lower extremities. One posterior symmetrical field is used on each side of the spine, 25 cm. skin target distance, 25 cm. spark gap, 5 mm. Al, 400 R per sitting, three sittings per week, a total of 1200 to 1600 R per port of entry constituting a series and three weeks' intervals being allowed between the series.

The 7 cases are described more or less in detail. An amelioration of the symptoms was obtained in all instances. The gangrene became localized and the local syncope and asphyxia became less frequent, less painful and more circumscribed. The improvement was especially marked following the first irradiations, while later the lesions became more radioresistant. For the same reason it is advisable to apply diathermy between the intervals of the irradiation.—*T. Leucutia.*

Nemours-Auguste, and Barrieu. La radiothérapie dans le traitement de l'angine de poitrine. (Roentgen therapy in the treatment of angina pectoris.) *Bull. et mém. Soc. de radiol. méd. de France*, January, 1929, *17*, 27-31.

Fifty cases of angina pectoris (of cardiovascular origin) were treated by roentgen therapy. In 31 cases there was disappearance of the painful spells; in 8 there was amelioration; in 5 there was no improvement; in one there was aggravation, and 6 cases died.

The 6 cases who died are described more or less in detail and the possibility of the roentgen irradiation contributing to the cause of death is discussed.

The belief is expressed that roentgen therapy cannot be considered responsible for the death in the above cases. In view of the fact that some truly remarkable results were obtained in many of the other cases, it is recommended that irradiation be used routinely for the treatment of angina pectoris.

The technique of irradiation is as follows: 25 cm. spark gap, 6 to 8 mm. Al filter, 2 ma., 30 cm. skin target distance, treatment being repeated at intervals of two to three weeks according to the condition of the patient, four ports of entry (2 anterior and 2 posterior) being used for each treatment and a dose of from 300 to 400 R being administered at a sitting.—*T. Leucutia.*

Chaperon. Au sujet de la radiothérapie dans le traitement de l'angine de poitrine. (On the subject of roentgen therapy in the treatment of angina pectoris.) *Bull. et mém. Soc. de radiol. méd. de France*, February, 1929, *17*, 55-57.

The author, in association with Laubry, has treated several cases of angina pectoris by means of roentgen irradiations by using a technique similar to that of Nemours-Auguste, but the results have been very discouraging. Moreover, Laubry had the opportunity of examining 3 cases treated by Nemours-Auguste and the results of roentgen therapy were deplorable. An exacerbation of the pain was produced in all 3 instances, the roentgen therapy resulting in aggravation of the symptoms.

The author is of the opinion that roentgen therapy is of no value in the treatment of angina pectoris and that it may lead to grave accidents.—*T. Leucutia.*

Seisser, Franz. Erfahrungen mit der Röntgenbehandlug der genitalen Entzündungen. (Experiences with roentgen irradiation of genital inflammations.) *Strahlentherapie*, 1929, *33*, 471-478.

Three hundred cases of various inflammations of the genital organs were treated with irradiation at the Frauenklinik of Magdeburg. This series includes subacute and chronic conditions which have proved refractory to other conservative methods, recurrent cases and especially cases with extensive pelvi-peritonitic and parametric infiltrations where operation could not be attempted. Of the acute cases only those resulting in diffuse peritonitis were irradiated.

Three methods of irradiation were used: (1) The unilateral permanent castration which has the great advantage that it is simple, that it can be applied in both unilateral and bilateral processes (there being sufficient scattering to affect the opposite side) and that it produces no injury to the non-irradiated ovary. (2) The mild irradiation with initial doses of 100 R and repeated later (at four to six weeks' intervals) with 50 R, which is of great advantage in genital and peritoneal tuberculosis as well as in inflammations in which on account of the severe general debility caution has to be exercised. (3) Complete permanent castration (with 50 to 60 per cent skin unit dose) which is applied especially in women near the climacterium.

In cases suspicious of malignancy irradiation with large doses (100 per cent S. U. D.) is given.

While an immediate improvement was observed in the majority of the cases, the permanent results were tabulated (for 208 cases which were followed up) as follows:

1. Unilateral castration—110 cases with 89 per cent permanent healing.

2. Mild irradiation—54 cases of which 28 were chronic inflammations, with 86 per cent permanent healing, and 26 genital tuberculosis (in instances complicated by tuberculous peritonitis), with 21 cases permanently healed.

3. Full castration—44 cases, with 84 per cent permanent healing.

4. Sixteen cases which were suspicious of malignancy were treated with doses ranging from 50 to 100 per cent S. U. D. The results in these cases are not indicated.

The conclusion is reached that roentgen irradiation is a great therapeutic adjuvant especially in old refractory and recurrent inflammations of the adnexa, preventing in many instances severe operative procedures. A complete clinical and anatomic healing may result even in the most advanced processes.—*T. Leucutia.*

CUTLER, MAX. Radiosensitive intra-oral tumors. *Arch. Surg.*, June, 1929, *18*, 2303-2323.

Ewing in 1928 called attention to a certain group of epidermoid carcinomas, particularly of the tongue, nasopharynx and larynx which have a high degree of malignancy and run an unusually rapid course. These tumors have a peculiar histologic structure, notably the absence of squamous features and the presence of transitional epithelial characters. In 1921, Regaud recognized the peculiar microscopic changes and radiosensitivity of certain tonsillar and nasopharyngeal tumors. He was impressed with a close and constant relation between the epithelial and lymphoid elements, and therefore applied to them a new term of "lymphoepitheliome." Reverchon and Coutard, Schmincke, Derigs, and others have reported similar cases. Quick and Cutler noted that these lesions had a marked susceptibility to irradiation and termed them "transitional cell epidermoid carcinomas."

The microscopic structure can be divided into two distinct types: (*a*) lympho-epitheliomas, and (*b*) transitional cell carcinomas.

(*a*) *Lympho-epithelioma.* Occurs rarely, only 19 in a series of 300 cases. The structure shows wide sheets of epithelial cells infiltrating the surrounding lymphoid tissue. The cells are large and pale, the protoplasm is ill defined. The nuclei are large, clear and pale. Nucleoli are prominent and mitosis abundant. The structure in general is difficult to distinguish from reticulum cell lymphosarcoma and primary endothelioma.

(*b*) *Transitional Cell Carcinoma.* These tumors occur more frequently, comprising about 10 per cent of the tumors occurring in these regions. The cells grow diffusely in cords and infiltrate the surrounding tissue. Polymorphonuclear leucocytes, lymphocytes and plasma cells are numerous. The cells show marked loss of differentiation and may reach a high grade of anaplasia and the epithelial characteristics are almost lost. The similarity of these tumors and radiosensitive tumors elsewhere is noteworthy, such as those that occur occasionally in the esophagus and the cervix uteri.

Histogenesis. The exact origin of these tumors is unknown, but the most popular theory is that the anaplasia accounts for the peculiar histologic features of transitional cell carcinoma.

Primary Lesion. The common locations are the pharyngeal tonsil, lingual tonsil, base of the tongue and nasopharynx. The larynx and esophagus are less frequent sites. On inspection, the tumor appears as a finely granular surface suggesting an erosion rather than frank ulceration. Sometimes one only finds fixation of the mucous membrane over a mass of tumor tissue. Oftentimes the first symptoms may be glandular enlargements in the neck, and several cases had operations on the neck glands without determining the original lesion. Some of the lesions progress rapidly, others terminate fatally, others have a rather slow course.

Differential Diagnosis. Lympho-epithelioma and transitional cell carcinoma must be differentiated from squamous carcinoma, lymphosarcoma and bronchiogenic carinoma and endothelioma. It is very difficult and usually can be made only after biopsy. The clinical course and observations are often of great assistance.

Response to Irradiation—Therapeutic Test. These tumors are radiosensitive to comparatively small doses. They recur rapidly unless all of the growth has been removed.

The treatment should be planned, keeping in mind: (1) their high degree of malignancy, and (2) their marked susceptibility to irradiation. Surgical intervention is to be discouraged. Irradiation by roentgen rays or radium or by a combination over the primary lesion and the involved areas is the method of choice. The author reports 9 cases well after three years. —*E. P. Pendergrass.*

JOLY, M., and QUIRIN. Action directe ou action secondaire de la roentgenthérapie du cancer: Un fait. (Direct or secondary action of roentgen therapy in cancer?) *Bull. et mém. Soc. de radiol. méd. de France*, February, 1929, *17*, 81-83.

A case of multiple metastases following carcinoma of the breast which was treated by roentgen therapy is briefly described. The interesting feature in the case is the fact that of

the numerous skin nodules which occurred on the anterior thorax along the scar only those disappeared which were directly treated, while all other nodules, even those immediately adjacent to the borders of the areas treated which no doubt received at least 15 per cent scattered radiation, remained uninfluenced.

In the authors' estimation this proves that there is no secondary effect of the radiation and that the action is directly on the cells by the destructive effect of the roentgen rays.—*T. Leucutia.*

Wintz, Herman. Ergebnisse der Strahlenbehandlung beim Uteruscarcinom und Mammacarcinom. (Results of radiation therapy in uterine and mammary carcinomas.) *Strahlentherapie*, 1929, *33*, 456-466.

The method employed by the author is that of roentgen therapy alone. Only in a few instances, for example, carcinoma of the vagina, of the rectum, anus, and carcinomas of the corpus uteri was a combination of roentgen and radium therapy used.

The method of procedure is as follows: First, thorough local and general preliminary treatment is given (disinfection, copperization, etc.), all patients being hospitalized. In the uterine carcinomas the roentgen treatment is carried out with small (6×8 cm. and 8×8 cm.) fields, in two series. In the first series the uterus alone is treated by administering a full carcinoma dose, while in the second series, eight weeks later, the treatment is directed mainly to the parametria (at the same time a dose of 80 per cent S. U. D. being administered over the primary lesion). In mammary carcinomas the two irradiations are carried out with larger fields at ten to twelve weeks' intervals. The general rule that the first roentgen dose decides the fate of the patient still holds good. Therefore a very careful measurement of the first dose is necessary and therapeutic test irradiations are entirely to be discarded.

In publishing the results obtained by the above method of irradiation, the following rules are taken into consideration: (1) the statistics include all cases whether or not treatment was completed; (2) only absolutely sure carcinomas were included; (3) only cases which at an examination five years after the completion of the treatment were found to be entirely symptom-free and healthy are considered as cured; (4) the statistics are divided into "well"and "lost" cases. These latter include all cases who died regardless of whether or not the cause of death was due to carcinoma or some other disease, and the cases which are alive but which showed at the five-year examination such extensive metastases that their death is to be expected soon; (5) the carcinomas are divided into (*a*) operable, (*b*) inoperable and (*c*) cachectic cases.

The recurrences following operation are dealt with in a separate group.

1. The results in uterine carcinomas. According to Heyman's collection from the world literature the five-year surgical cure in the operable uterine carcinomas is 35.6 per cent for collum carcinomas, and 58.8 per cent for corpus carcinomas. The author's results are as follows:

A. *In collum carcinomas:*

(*a*) 108 operable cases, 57.4 per cent symptom-free after 5 years;
(*b*) 632 inoperable cases, 12.3 per cent symptom-free after 5 years;
(*c*) 125 operable cases, 86.9 per cent symptom-free after 3 years;
(*d*) 712 inoperable cases, 16.1 per cent symptom-free after 3 years.

B. *In corpus carcinomas:*

(*a*) 48 operable cases, 66.6 per cent symptom-free after 5 years;
(*b*) 53 inoperable cases, 5.6 per cent symptom-free after 5 years;
(*c*) 59 operable cases, 74.5 per cent symptom-free after 3 years;
(*d*) 60 inoperable cases, 13.0 per cent symptom-free after 3 years.

The figures for the collum carcinomas which were obtained by roentgen irradiation alone are compared with the figures of the Radiumhemmet (Forssell-Heyman) of Stockholm and and of the Radium Institute (Regaud) of Paris, where as it is known radium therapy forms the method of treatment.

Operable:

Stockholm: 145 cases, with 46.2 per cent 5 year cures.
Paris: 93 cases, with 25.8 per cent 4 to 5 year cures.
Erlangen: 108 cases, with 57.4 per cent 5 year cures.

Inoperable:

Stockholm: 357 cases, with 13.9 per cent 5 year cures;
Paris: 129 cases, with 10.0 per cent 4 to 5 year cures;
Erlangen: 632 cases, with 12.3 per cent 5 year cures.

The 3 year results were as follows:

Operable:

Stockholm: 109 cases, with 54.0 per cent 3 year cures;
Paris: 63 cases, with 52.3 per cent 3 year cures;
Erlangen: 48 cases, with 73.0 per cent 3 year cures.

Inoperable:

Stockholm: 176 cases, with 17.0 per cent 3 year cures;
Paris: 79 cases, with 22.7 per cent 3 year cures;
Erlangen: 240 cases, with 22.0 per cent 3 year cures.

According to the author, the better results with roentgen therapy alone are due, besides better irradiation conditions, also to the fact that roentgen therapy is a procedure producing less irritation than the insertion of radium which often leads to secondary infections.

The results in the recurrent uterine carcinomas following Wertheim's operation are as follows:

118 cases, 17.0 per cent symptom-free at the end of 3 to 4 years;
104 cases, 9.6 per cent symptom-free at the end of 5 to 6 years;
59 cases, 6.7 per cent symptom-free at the end of 8 to 9 years.

2. The results in mammary carcinoma. The classification adopted is that of Steinthal. Group I: Small tumor without involvement of deeper structures or adjacent lymph nodes; Group II: Large tumor with involvement of the greater portion of the breast and lymph nodes of the axilla; Group III: Extension to the supraclavicular lymph nodes.

A. *Operable mammary carcinomas*—Steinthal I and II.

72 cases, 79 per cent symptom-free at the end of 3 years;
66 cases, 53 per cent symptom-free at the end of 5 years.

In all these instances radiation therapy was carried out first, and eight to fourteen days following irradiation the tumor was removed for microscopic examination. The axilla was left intact. More recently the tumor is extirpated with the diathermic scalpel. In a few instances only one axillary gland was removed for biopsy, the tumor itself having been left intact.

B. *Inoperable mammary carcinomas*—Steinthal III.

65 cases, 20 per cent symptom-free at the end of 3 years;
50 cases, 12 per cent symptom-free at the end of 5 years.

C. *Irradiation in recurrences:*

165 cases, 34 per cent symptom-free at the end of 3 years;
136 cases, 19 per cent symptom-free at the end of 5 years;
71 cases, 10 per cent symptom-free at the end of 8 years.

These figures prove that mammary carcinoma can be treated just as successfully by roentgen therapy as uterine carcinomas. Since in the beginning cases of mammary carcinoma (Steinthal I) surgery can accomplish the removal of the tumor, this method can be safely used. In the more advanced cases, however, roentgen therapy appears to be considerably superior to operative procedures and therefore the question arises whether one should not submit all such cases primarily to irradiation.

The value of a combination of surgery and roentgen therapy is not as yet sufficiently clear. In all operable cases treated by the author which belong to Steinthal Groups I and II the tumors were removed in order to ascertain the microscopic diagnosis and consequently a sort of a combined treatment was applied. The removal of the tumor might be important since it prevents the systemic absorption of a large amount of carcinoma cells killed by irradiation. On the other hand, the absorption of such destruction products may lead to stimulation of healing processes.

The criteria influencing the response of the carcinoma to roentgen irradiation are: (1) the localization of the lesion; (2) the character of the tumor and neighboring tissues; (3) the size and technique of application of the dose; (4) preliminary and after-treatment, and (5) the reactive response of the organism.—*T. Leucutia.*

FENWICK, P. CLENNELL. The radium climacteric. *Brit. M. J.*, Sept. 7, 1929, *2*, 455.

Fenwick states that in the menorrhagia of middle life, radium has proved of so much

value, that if malignancy and fibroid disease are carefully excluded, radium can be safely recommended. In the radium and deep therapy department of the Christchurch Hospital, New Zealand, 89 patients suffering from severe uterine hemorrhage have been treated during the last four and one-half years. The average age of the patients was forty-seven years and the average duration of the hemorrhage before treatment was two years. Of the 89 patients, 73 are reported as quite free from symptoms, 2 have been lost sight of, one failed to receive any benefit from the treatment and 13 have been too recently treated to report.

In 20 cases, cessation of hemorrhage occurred immediately after treatment; in 15 four weeks after treatment; one, three weeks; one, six weeks; 4, eight weeks; one, six months, and one, seven months, the latter being the longest interval reported.

Twenty patients reported no bleeding after the treatment; 17 reported one bleeding, and two bleedings occurred in 7 patients.

Twenty patients had pain before treatment and of these 15 reported entire absence of pain after treatment, 4 reported pain still present but of less degree, and one stated there was no improvement in the pain.

Four patients suffered from painful and frequent micturition before treatment, and in 3 the condition was improved, one reporting that no improvement had occurred.

In 14 cases there were no reports of any climacteric symptoms after treatment, 29 complained of hot flushes, 25 of headaches, and 13 of stiffness and indefinite pains in the joints. Rheumatism is however so prevalent in New Zealand that the complaint of stiffness and vague pains in the joints is very common in middle-aged people of either sex.

Fenwick concludes after careful inquiry among women who are passing through the normal change of life, that there is no evidence that the climateric produced by radium treatment differs in any way, except in rapidity, from the normal period of disturbance experienced by middle-aged women. He has treated 6 cases of uterine fibroids with hemorrhage, the patients having refused operation or being unable to undergo surgical treatment, and in 3 cases the relief was remarkable, hemorrhage ceasing, and other symptoms being relieved. He believes that with the increased use of radium, many cases of intractable uterine hemorrhage will not be allowed to wait until chronic invalidism occurs, but will receive prompt relief from the use of radium.—*R. S. Bromer.*

Aviragnet, and Duhem, P. Fibro-sarcome périosté de la colonne vertébrale dorsale arrêté dans son évolution par la radiothérapie (Periosteal fibrosarcoma of the dorsal vertebral column arrested by roentgen therapy.) *Bull. et. mém. Soc. de radiol méd. de France*, February, 1929, *17*, 79-80.

A case of fibrosarcoma originating from the periosteum of the dorsal spine is described in a child four years of age. First a diagnosis of paravertebral abscess was made and the patient treated medically. Since subsequent roentgenograms failed to reveal any improvement, operation was decided upon. A fibrosarcoma originating from the periosteum of the vertebral column was found. Because of the inoperability of the condition roentgen therapy was administered, a dose of 3240 R being given over the right hemithorax through three ports of entry. Twenty-five days later 2400 R and again one month and six months later 1750 R (Total 9000 R) was given. The quality of the roentgen rays used was 28 cm. spark gap, with 10 mm. Al.

The lesion was arrested and a re-examination five years later revealed a very satisfactory condition of the patient.—*T. Leucutia.*

MISCELLANEOUS

Sgalitzer, Max. Zur Technik der Röntgenuntersuchung der vier obersten Brustwirbel in seitlicher Richtung. (The technique of the roentgen examination of the four upper dorsal vertebrae in lateral projection.) *Fortschr. a. d. Geb. d. Röntgenstrahlen*, August, 1929, *40*, 267-271.

Bársony and Koppenstein recently published a method for the lateral visualization of the upper portion of the thoracic spine. The author calls attention to the fact that a somewhat similar method was published by him in 1918, in a surgical journal. On account of the pertinence of the problem he republishes his technique, which is as follows: The patient is laid in a straight lateral position (the knees being flexed), with a maximum throwing back of the

shoulders and with the hands being crossed in the back. The head is elevated by sandbags and the tube is centered over the acromial end of the clavicle (five fingers from its sternal end) just in front of the head of the humerus. A Bucky diaphragm is used.

The advantage of this method is that it gives in addition to the upper thoracic spine, a very good visualization of the larynx and trachea, of the filled esophagus, of the manubrium sterni, of the sternoclavicular articulations and of the upper ribs. The drawback of the method is that it cannot be used in old persons or in injuries around the upper thorax since it requires a maximum drawing back of the shoulders. It is recommended that in such instances the projection of Bársony and Koppenstein be resorted to.—*T. Leucutia.*

DITTMAR, OTTO. Halbseitliche Aufnahmen des Lendenwirbel-Kreuzbein-Abschnittes. (Semilateral projection of the lumbosacral region.) *Fortschr. a. d. Geb. d. Röntgenstrahlen*, July, 1929, *40*, 99-107.

In a previous article (see abstract, this Journal, September, 1929, p. 276) the author briefly described the technique of the semilateral projection of the lumbosacral region. In the present article the method is discussed in detail and its practical applicability is indicated.

The technique already described does not suffice in all instances.

In certain cases a second technique is used which has the advantage that, in addition to the lumbosacral region, part of the hip-joint is also visualized, the acetabular cavity being especially well brought out. Here also, the patient lies half between true lateral and true recumbent positions, with a 35° angulation between the body and the pelvis on the one hand, and the table, on the other hand. The position of the arms and thighs, as well as the fixation, is the same as in the previously described method. A 30×40 cm. plate is used and the patient is placed so that the upper border of the plate reaches a hand's breadth above the pelvic brim and the central ray is directed at the intersection of two lines, the perpendicular of which runs one hand's breadth laterally from the umbilicus and the horizontal line of which runs one hand's breadth below the umbilicus. Seven cases are briefly described illustrating the value of the two methods in different pathological conditions of the lumbosacral region. The conclusion is reached that the method forms an important addition to the roentgenographic examination made in the ventrodorsal and true lateral positions.—*T. Leucutia.*

HASSELWANDER, A. Gefahren für die weitere Entwicklung der Röntgenstereoskopie. (Dangers of the further development of roentgen stereoscopy.) *Fortschr. a. d. Geb. d. Röntgenstrahlen*, August, 1929, *40*, 189-213.

The author gives a review of the latest developments in connection with roentgen stereoscopy and analyzes the dangers which might result from an overdevelopment of roentgen stereoscopic techniques. Especially the telestereoscopy and hyperstereoscopy of Dioclès and the more recently published views of Barth in regard to roentgen stereoscopy in relation to optic physiology are severely criticized.

As is known, Dioclès advocates an increased film focus distance of from 120 to 250 cm. (telestereoscopy) and a proportionally increased tube distance (hyperstereoscopy) for all steroscopic examinations, believing that on account of greater sharpness of the parts closer to or farther from the film and on account of the reduction of voluminous body parts to smaller sizes a better spatial impression can be obtained. There can be no doubt that stereoroentgenograms taken with more or less parallel rays (as practised in stereoroentgenography) lead to a lesser distortion of the objects examined and thus to a greater spatial accuracy, but the reading of such roentgenograms under central projection leads to equal distortions and thus to erroneous spatial effect. On the other hand, a good impression of the form, position and size of the parts to be examined is obtained with stereoroentgenograms taken at shorter distances also for voluminous body parts, and the accurate localization of certain processes (especially in thoracic surgery) is directly superior.

Barth, in analyzing roentgen stereoscopy in relation to optic physiology, expresses the view that the objective criteria necessary in order to give the impression of spatial vision in photographs (the influence of the geometric perspective, overlapping and covering of two objects, the shadow effect and the air perspective) are of no use in roentgenograms and that consequently the subjective impression is of con-

siderably greater importance. In analyzing the above objective criteria the author is convinced that they are of great value also in stereoroentgenograms and that consequently they should not be abandoned in favor of the subjective impressions.

It is wise that one should maintain methods which are the result of long experience and which have proved of enormous practical value. Our aim should be to arrive at the ideal objective step by step.—*T. Leucutia.*

Alberti, W. Tele-Chiasmo-Röntgenstereoskopie. (Tele-chiasmo-roentgen stereoscopy.) *Fortschr. a. d. Geb. d. Röntgenstrahlen*, July, 1929, *40*, 68-75.

A method is described for stereoscopic roentgenoscopy, photography and stereoscopic roentgenography in which the two images are projected on the screen or film simultaneously side by side. This is obtained by the use of two roentgen tubes which are focused so that the central beams cross on the object and the images project on a screen or film which is placed at a definite distance from the object. The tubes may be run simultaneously or alternatingly. By means of a diaphragm system both roentgen beams can be limited and by approximation of the object towards the screen or film the distance between the two projected images can be controlled.

The distance between the focuses of the two roentgen tubes (Δ) is governed by the formula of Dioclès according to which if the thickness of the object to be examined (E) is equal to the distance of the focuses of the two tubes (Δ) the focus film distance (DF) will be equal to $8E$, that is, if the thickness of the thorax, for example, is 20 cm., and the distance of the focuses is likewise 20 cm. The focus film distance must be $8 \times 20 = 160$ cm. The quality of the images obtained is excellent since the sharpness of different depths is good and since there is very little stray radiation.

The method permits stereoscopic roentgenoscopy without stroboscopic arrangement and and stereoroentgenography without the usual changes of cassette.—*T. Leucutia.*

Schekter, L. La radiographie pulmonaire double et simultanée. (Double and simultaneous pulmonary roentgenography.) *Bull. et mém. Soc. de radiol. méd. de France*, January, 1929, *17*, 25-26.

The author describes a simple procedure which permits the simultaneous use of two films in roentgenography of the chest. The two films are placed with special intensifying screens in the same cassette and the usual exposures made. The film nearer to the patient will thus give a darker image while the film distant from the patient will appear somewhat lighter. This difference in the quality of the two images often permits the recognition of small parenchymatous lesions which otherwise would escape detection.—*T. Leucutia.*

Philips, Herman B. A simple complete diagnostic x-ray unit adapted to all possible surgical and medical needs. *J. Bone & Joint Surg.*, Oct., 1929, *11*, 739-746.

Philips describes an apparatus for diagnostic roentgen examinations consisting of two separate units, a fracture stretcher, and the roentgen-ray unit. This apparatus he claims is adapted for all possible surgical and medical needs. He believes that the new fracture stretchers and biplane roentgenoscopes, lately described in published articles in *Radiology*, *American Journal of Roentgenology and Radium Therapy* and *Journal of Bone and Joint Surgery* are incomplete and lacking in fundamentals in their construction.

The stretcher is made of aluminum, and is radiolucent in all parts within the frame. A traction device is so arranged that any part of the patient's body may be suspended by it without mechanical interference during manipulation or immobilization, and at the same time provide ready accessibility for roentgenoscopy or roentgenography with an absolute minimum obstruction to the roentgenoscopic or roentgenographic fields by radiopaque parts of the apparatus. The stretcher is light in weight and is easily transported to roentgen-ray operating rooms, or anywhere, even in ambulances. It can be used as a fracture table apart from the roentgen-ray apparatus, or in conjunction with it, as desired. The entire stretcher, including the frame, is collapsible and occupies very little space when unassembled.

The roentgen-ray unit consists of two separate, compact, shock-proof roentgen-ray units incorporated with a tilt Potter-Bucky table. One unit is underneath the table, mounted on rails in such a way as to be easily moved under any part of the table. The other unit is suspend-

shoulders and with the hands being crossed in the back. The head is elevated by sandbags and the tube is centered over the acromial end of the clavicle (five fingers from its sternal end) just in front of the head of the humerus. A Bucky diaphragm is used.

The advantage of this method is that it gives in addition to the upper thoracic spine, a very good visualization of the larynx and trachea, of the filled esophagus, of the manubrium sterni, of the sternoclavicular articulations and of the upper ribs. The drawback of the method is that it cannot be used in old persons or in injuries around the upper thorax since it requires a maximum drawing back of the shoulders. It is recommended that in such instances the projection of Bársony and Koppenstein be resorted to.—*T. Leucutia.*

DITTMAR, OTTO. Halbseitliche Aufnahmen des Lendenwirbel-Kreuzbein-Abschnittes. (Semilateral projection of the lumbosacral region.) *Fortschr. a. d. Geb. d. Röntgenstrahlen*, July, 1929, *40*, 99-107.

In a previous article (see abstract, this Journal, September, 1929, p. 276) the author briefly described the technique of the semilateral projection of the lumbosacral region. In the present article the method is discussed in detail and its practical applicability is indicated.

The technique already described does not suffice in all instances.

In certain cases a second technique is used which has the advantage that, in addition to the lumbosacral region, part of the hip-joint is also visualized, the acetabular cavity being especially well brought out. Here also, the patient lies half between true lateral and true recumbent positions, with a 35° angulation between the body and the pelvis on the one hand, and the table, on the other hand. The position of the arms and thighs, as well as the fixation, is the same as in the previously described method. A 30×40 cm. plate is used and the patient is placed so that the upper border of the plate reaches a hand's breadth above the pelvic brim and the central ray is directed at the intersection of two lines, the perpendicular of which runs one hand's breadth laterally from the umbilicus and the horizontal line of which runs one hand's breadth below the umbilicus. Seven cases are briefly described illustrating the value of the two methods in different pathological conditions of the lumbosacral region. The conclusion is reached that the method forms an important addition to the roentgenographic examination made in the ventrodorsal and true lateral positions.—*T. Leucutia.*

HASSELWANDER, A. Gefahren für die weitere Entwicklung der Röntgenstereoskopie. (Dangers of the further development of roentgen stereoscopy.) *Fortschr. a. d. Geb. d. Röntgenstrahlen*, August, 1929, *40*, 189-213.

The author gives a review of the latest developments in connection with roentgen stereoscopy and analyzes the dangers which might result from an overdevelopment of roentgen stereoscopic techniques. Especially the telestereoscopy and hyperstereoscopy of Dioclès and the more recently published views of Barth in regard to roentgen stereoscopy in relation to optic physiology are severely criticized.

As is known, Dioclès advocates an increased film focus distance of from 120 to 250 cm. (telestereoscopy) and a proportionally increased tube distance (hyperstereoscopy) for all steroscopic examinations, believing that on account of greater sharpness of the parts closer to or farther from the film and on account of the reduction of voluminous body parts to smaller sizes a better spatial impression can be obtained. There can be no doubt that stereoroentgenograms taken with more or less parallel rays (as practised in stereoroentgenography) lead to a lesser distortion of the objects examined and thus to a greater spatial accuracy, but the reading of such roentgenograms under central projection leads to equal distortions and thus to erroneous spatial effect. On the other hand, a good impression of the form, position and size of the parts to be examined is obtained with stereoroentgenograms taken at shorter distances also for voluminous body parts, and the accurate localization of certain processes (especially in thoracic surgery) is directly superior.

Barth, in analyzing roentgen stereoscopy in relation to optic physiology, expresses the view that the objective criteria necessary in order to give the impression of spatial vision in photographs (the influence of the geometric perspective, overlapping and covering of two objects, the shadow effect and the air perspective) are of no use in roentgenograms and that consequently the subjective impression is of con-

siderably greater importance. In analyzing the above objective criteria the author is convinced that they are of great value also in stereoroentgenograms and that consequently they should not be abandoned in favor of the subjective impressions.

It is wise that one should maintain methods which are the result of long experience and which have proved of enormous practical value. Our aim should be to arrive at the ideal objective step by step.—*T. Leucutia.*

Alberti, W. Tele-Chiasmo-Röntgenstereoskopie. (Tele-chiasmo-roentgen stereoscopy.) *Fortschr. a. d. Geb. d. Röntgenstrahlen*, July, 1929, *40*, 68-75.

A method is described for stereoscopic roentgenoscopy, photography and stereoscopic roentgenography in which the two images are projected on the screen or film simultaneously side by side. This is obtained by the use of two roentgen tubes which are focused so that the central beams cross on the object and the images project on a screen or film which is placed at a definite distance from the object. The tubes may be run simultaneously or alternatingly. By means of a diaphragm system both roentgen beams can be limited and by approximation of the object towards the screen or film the distance between the two projected images can be controlled.

The distance between the focuses of the two roentgen tubes (Δ) is governed by the formula of Dioclès according to which if the thickness of the object to be examined (E) is equal to the distance of the focuses of the two tubes (Δ) the focus film distance (DF) will be equal to $8E$, that is, if the thickness of the thorax, for example, is 20 cm., and the distance of the focuses is likewise 20 cm. The focus film distance must be $8 \times 20 = 160$ cm. The quality of the images obtained is excellent since the sharpness of different depths is good and since there is very little stray radiation.

The method permits stereoscopic roentgenoscopy without stroboscopic arrangement and and stereoroentgenography without the usual changes of cassette.—*T. Leucutia.*

Schekter, L. La radiographie pulmonaire double et simultanée. (Double and simultaneous pulmonary roentgenography.) *Bull. et mém. Soc. de radiol. méd. de France*, January, 1929, *17*, 25-26.

The author describes a simple procedure which permits the simultaneous use of two films in roentgenography of the chest. The two films are placed with special intensifying screens in the same cassette and the usual exposures made. The film nearer to the patient will thus give a darker image while the film distant from the patient will appear somewhat lighter. This difference in the quality of the two images often permits the recognition of small parenchymatous lesions which otherwise would escape detection.—*T. Leucutia.*

Philips, Herman B. A simple complete diagnostic x-ray unit adapted to all possible surgical and medical needs. *J. Bone & Joint Surg.*, Oct., 1929, *11*, 739-746.

Philips describes an apparatus for diagnostic roentgen examinations consisting of two separate units, a fracture stretcher, and the roentgen-ray unit. This apparatus he claims is adapted for all possible surgical and medical needs. He believes that the new fracture stretchers and biplane roentgenoscopes, lately described in published articles in *Radiology*, *American Journal of Roentgenology and Radium Therapy* and *Journal of Bone and Joint Surgery* are incomplete and lacking in fundamentals in their construction.

The stretcher is made of aluminum, and is radiolucent in all parts within the frame. A traction device is so arranged that any part of the patient's body may be suspended by it without mechanical interference during manipulation or immobilization, and at the same time provide ready accessibility for roentgenoscopy or roentgenography with an absolute minimum obstruction to the roentgenoscopic or roentgenographic fields by radiopaque parts of the apparatus. The stretcher is light in weight and is easily transported to roentgen-ray operating rooms, or anywhere, even in ambulances. It can be used as a fracture table apart from the roentgen-ray apparatus, or in conjunction with it, as desired. The entire stretcher, including the frame, is collapsible and occupies very little space when unassembled.

The roentgen-ray unit consists of two separate, compact, shock-proof roentgen-ray units incorporated with a tilt Potter-Bucky table. One unit is underneath the table, mounted on rails in such a way as to be easily moved under any part of the table. The other unit is suspend-

ed from a single upright bar at the back of the table. This is suspended in such a way that any angle or position is obtainable with it, and when not in use, it can be pushed back, entirely out of the way, or can be used for examinations on beds or stretchers without moving the patient onto the roentgen-ray table. The Potter-Bucky diaphragm is also mounted on rails and can be easily moved.

Each roentgen unit consists of an oil-immersed transformer and tube, capable of 60,000 volts with 30 milliamperes.

This apparatus can be used for all fracture work, including the application of casts, for biplane roentgenoscopy for removal of foreign bodies in the lungs or elsewhere, for urologic work, and also for vertical roentgenoscopy. Philips states that this unit has been the sole roentgen-ray disgnostic equipment of a large private hospital in New York City with a very exacting attending staff. The machine has rendered perfect service in all types of roentgenographic work, including mastoids, sinuses, chests, gastrointestinal and bone and joint conditions. Collaboration with several urologists in making urologic roentgen-ray studies, has resulted in extreme satisfaction and the combination of the biplane roentgenoscope and the radiolucent fracture stretcher has been especially pleasing to surgeons and orthopedists. The article is illustrated, showing the different methods of employment of the apparatus in the various types of work.—*R. S. Bromer.*

PATEY, D. H., and SCARFF, R. W. Further observations on the histology of carcinoma of the breast. *Lancet*, Sept. 7 1929, *2*, 492-494.

The authors in a previous communication brought forward evidence to show that in the case of carcinoma of the breast a relation between the histological appearance and the subsequent clinical course did not exist. They concluded that the histological index of malignancy should be used only as an auxiliary to other factors, and that the important point was the stage to which the disease had advanced at the time the treatment was undertaken. In actual practice, they believed that the histological malignancy should prove of prognostic value in cases in which the disease had spread from the breast to the axillary glands, but had not yet widely infiltrated those glands, yi.e., a group intermediate between the earl and the advanced cases of carcinoma of the breast. In furtherance of this previous work, they report in this paper a study of the relation between the histological appearance of the primary growth and that of its secondary deposits and, further, the histology of those tumors of the breast which have given rise to metastases in the glands compared with the appearances of those growths in which microscopical examination of the axillary glands had failed to demonstrate metastases.

The three characteristics on which they laid most stress in this study in establishing the degree of malignancy were: (1) tubule formation; (2) irregularity in size and shape of the nuclei; (3) hyperchromatism. Other factors noted were: (4) the amount of secretion, and (5) the number of mitoses. No attention was paid to the presence of fibrosis, leucocytic infiltration, or any factor not concerned with the appearance of the epithelial cells. In order to obtain an opinion as unbiased as possible the sections of all the primary tumors were first examined, and then independently the sections of the secondary deposits. Each primary growth was then compared with its metastases, and any differences noted on the independent examination were discussed and if necessary confirmed.

One hundred and ten carcinomata of the breast with their secondary deposits in the axillary glands, and 53 cases without secondary deposits were examined. In the large majority of instances (83 per cent), the secondary deposits in the lymphatic glands were similar in appearance and malignancy to the primary growth; in an appreciable minority (16 per cent), the malignancy of the glandular metastases was lower, but in only one case was the malignancy raised. The series of cases in which secondary deposits were not found in the axillary glands shows a relatively much greater number of tumors of low histological malignancy than did the series with such deposits. —*R. S. Bromer.*

BETTMAN, RALPH B., KELLY, JOHN, and CROHN, NATHAN. The effect of intrabronchial injections of iodized poppy seed oil 40 per cent; an experimental study on dogs. *Arch. Surg.*, Sept., 1929, *19*, 471-477.

The authors were interested in determining if iodized poppy seed oil 40 per cent had any effect on the lung tissue of animals. They

utilized 12 dogs and 2 of them died, but the authors do not feel that instillation of the iodized oil had anything to do with the death. Another animal showed fibrosis, but this fibrosis was concluded to have been present prior to the instillation of the iodized oil. They conclude that the instillation of the iodized oil did not cause pneumonia or any cellular reaction that they could demonstrate. Most of the iodized oil is coughed up, but any that remains does not seem to act as a foreign body.—*E. P. Pendergrass.*

Schreus, H. Th. Über die Verteilung der Wismutdepots bei intramuskulärer Injektion unlöslicher Salze und die Dauer des röntgenologischen Nachweises. (On the distribution of the bismuth deposits in intramuscular injection of insoluble salts and the duration of their roentgen visibility.) *Fortschr. a. d. Geb.d. Röntgenstrahlen*, July, 1929, *40*, 42-46.

Since the introduction of bismuth therapy by Levaditi numerous investigations have been made on the duration of the absorption of the different bismuth preparations injected for therapeutic purposes.

The author was able to observe cases from six months to five and a half years following the completion of the bismuth treatment, and by taking a series of roentgenograms he found that there are three forms of distribution of the insoluble bismuth salts following the intramuscular injection: (1) the "plumb bob" appearance when there is no further distribution of the bismuth following the injection; (2) the "stripe or fan-like" appearance when the bismuth shortly after the injection diffuses through the neighboring tissues, and (3) the "milky way" appearance when the bismuth distributes itself over a greater portion of the injected muscle.

The absorption of the bismuth depends on several factors, such as the solubility of the bismuth salts, the carrier (thick or thin, easily absorbable, etc.), the local distribution of the tissues (encapsulation as a result of pronounced local reaction), the functional use of the muscles (massage, whether the patient is resting following the injection or is active, disuse as a result of pain), and finally the individual differences between man and animal and man and man.

The roentgen visibility of the injected bismuth lasts for a period of two years. In one case examined two and a half years later, in another three years later, in 2 cases four years later, and in one case five and a half years later, there was no evidence of a bismuth shadow.

No local or general disturbances were observed following the bismuth injections.

From the point of view of the roentgenologist the knowledge of the slow absorption of the insoluble bismuth salts is important since it prevents diagnostic errors.—*T. Leucutia.*

Küster, A. Die Wirkung der Röntgenstrahlen auf die nyktinastischen und seismonastischen Bewegungen. (The action of roentgen rays on the nyctinastic and seismonastic movements.) *Fortschr. a. d. Geb.d. Röntgenstrahlen*, August, 1929, *40*, 242-248.

1. The nyctinastic movements of the plants appear chiefly on the joined leaves due to turgor changes which depend on light and temperature conditions and which are manifest especially from day to night. Newer investigations revealed that these movements are the direct result of the irritability of the leaves in response to stimuli. The author investigated the applicability of the roentgen rays as such a stimulus.

The experiments were carried out on garden beans (*Phaseolus vulgaris*) by placing the experimental plants in a basement at a constant temperature and constant light and by exposing the joints of the leaves at definite intervals to certain doses of roentgen rays (the rest of the plant being protected by lead). The effect of the roentgen rays on the movements was then registered by a special apparatus constructed for this purpose.

The roentgen rays used were those of a Metro tube, with a Radiosilex apparatus, at 9 ma., and 80 kv., with 1 mm. Al filter, at a focus distance of 30 cm., the erythema dose having been obtained in 6.2 minutes. From 1.5 to 10.0 S. U. D. were administered in the various experiments.

It was found that the roentgen rays produced a paralytic effect on the leaves, which was of a permanent nature, and directly proportional to the dose applied.

2. Irradiation of mimosa plants. Similar experiments were carried out on *Mimosa pudica* with the exception that here, in addition to the stalk joints of the leaves also the joints of the leaf to leaf were exposed to irradiation.

In a first series of experiments hard roentgen

rays (7 ma., 40 kv., 30 cm. distance, 1 mm. Al, 1 S. U. D. being obtained in 6 minutes) were used and the irradiation was carried out with doses of from 10 to 30 S. U. D. In a second series of experiments very soft rays (produced by a copper target with Lindemann window; 9 ma., 50 kv., 50 cm. distance, 1 S. U. D. having been obtained in 15.2 sec) were used and doses were carried as high as 1200 S. U. D. It was found that a drooping of the leaves of *Mimosa pudica* could not be produced no matter how large the doses applied were. The paralytic effect was the same as for *Phaseolus vulgaris* with the exception that because of the lesser radiosensitivity of *Mimosa pudica* higher doses were required to produce the same effect. Hard rays were more effective on *Mimosa pudica* than soft rays, the ratio of the effectiveness being 1 to 14.—*T. Leucutia.*

KÜSTER, A. Wurzelbestrahlung junger Lupinenpflanzen und der Einfluss auf die Wurzelknöllchenbildung. (The irradiation of the roots of young lupine plants and the influence on the formation of rootlets.) *Forschr. a. a. Geb. d. Röntgenstrahlen*, July, 1929, *40*, 46-50.

Plants of *Lupinus albus* were exposed to radiation (1/10, 1/4, 1/2, 1, 2, 3, 5, 8 and 10 skin unit doses) and the effects of the radiation on the roots and formation of new rootlets were studied. The technique of irradiation was as follows: Radiosilex apparatus, Metro tube, 7 ma., 80 kv., 1 mm. Al, 20 cm. target distance, one erythema dose corresponding to 3 min. 55 sec.

The seedlings of *Lupinus albus* were placed in sawdust and only the plants having roots 7 cm. long and sprouts 6 cm. long were used for the experiments. During the actual irradiation the sprouts were protected by 3 cm. lead. Immediately following the irradiation the seedlings were planted in a special ground, consisting of sand (60 per cent) and garden earth (40 per cent), with the addition of axotogen and fertilizer. Beginning the eighth day the plants were examined at definite intervals both with regard to the length of their roots and the formation of new rootlets. The results obtained were plotted graphically.

It was found that small doses of radiation produced a stimulative effect on the growth of the plants and that larger doses had an inhibitive or destructive effect.

The experiments are important since they prove beyond doubt the stimulative action of roentgen gays.—*T. Leucutia.*

VARGA, GÉZA. Die Klemmenspannung des Röntgenapparates mit rotierendem Gleichrichter und seine Arbeitsweise. (The tube-end tension of the roentgen apparatus with rotating rectifier and its mode of action.) *Fortschr. a. d. Geb. d. Röntgenstrahlen*, July, 1929, *40*, 107-116.

On the basis of theoretical calculations and serial measurements on a roentgen apparatus with rotating rectifier, it was found that the loss of the high voltage for different kilovolts and milliamperes can be determined beforehand. In correcting the kilovoltmeter reading for the loss of the high voltage found one may estimate the tension at the tube ending, thus calculating the exact time of exposure for the different milliamperages.

The formula by which the loss of the high voltage can be determined is described in detail. Further experiments are in progress in order to determine whether or not this formula can be applied to all types of apparatus. —*T. Leucutia.*